

# Hospital Infection Control Manual



**HOSPITAL INFECTION CONTROL COMMITTEE**  
**CHRISTIAN MEDICAL COLLEGE & HOSPITAL**  
Vellore, Tamil Nadu.  
South India.



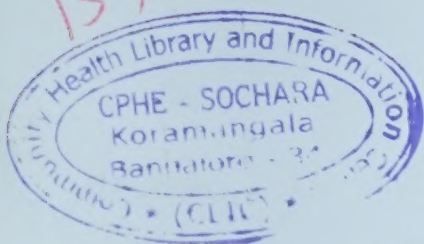
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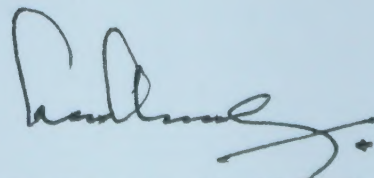


## PREFACE

Hospitals which provide healing and health can also pose major health hazards in the form of hospital acquired infections. The need for preventing and controlling transmission of such infections has been felt the world over. In our country, there is an increasing awareness of this need. Christian Medical College and Hospital, Vellore being a pioneering institution in the health care sector, prepared an Infection Control Manual and published it initially in 1995. This manual was well used in practice in CMCH and many other institutions. Since then, there has been considerable scientific progress, with changes in thinking based on the emergence of new infections and newer modalities to prevent and control infections. There has also been significant progress in the availability of equipment and materials in our country. We therefore felt that it is necessary to revise the manual to include current guidelines.

This 2<sup>nd</sup> edition of our Hospital Infection Control Manual contains guidelines mainly for our hospital. It may also help other hospitals in India to formulate their own guidelines. The general guidelines may not be applicable in certain situations and so may have to be modified to suit individual situations. Also, as science advances, guidelines can change and attempts will be made to update the manual periodically. The user, during this period, is advised to keep up with developments and modify guidelines if required.

I have been impressed by the sense of commitment of many members of our faculty and staff who has helped in preparing this manual. I take this opportunity to thank each and everyone involved in bringing out this edition of the manual.



**Dr. George M. Chandy**  
Medical Superintendent.





## HOSPITAL INFECTION CONTROL MANUAL

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## 1. ORGANISATION OF INFECTION CONTROL PROGRAMME IN CMCH

### 1.1 PHILOSOPHY OF INFECTION CONTROL

In order to provide better and safer hospital facilities for its patients and personnel, the Christian Medical College and Hospital has adopted a programme of infection control involving all sections of the hospital community.

A satisfactory infection control programme requires the co-operation of all personnel involved with patients. **Any break in technique or lapse in discipline on the part of one person can render the efforts of a number of conscientious individuals ineffective.**

The infection control programme will support and facilitate not only good hospital practices but also teach staff and students the necessary values, attitudes and behaviour. It is hoped that this programme will serve as a guide for excellent patient care and management in our institution and act as a model for others.

It may not be possible to eradicate all hospital-related infections. However, an effective infection control programme will provide optimum protection for both the hospital 'clientele' and the hospital staff. The purpose of this manual is to help all health care providers achieve the best possible infection control measures, as required by professional standards. Thus, this manual will contain statements of the hospital's policies as well as procedures to prevent nosocomial infection.

In all concerned departments, the departmental heads and all staff are responsible for becoming familiar with and implementing the hospital's policies and procedures that are designed to achieve the objectives of the infection control programme. **It is only through the co-operative efforts of every member of the staff that nosocomial infections can be prevented.**

### 1.2 DEFINITION OF NOSOCOMIAL INFECTIONS

Nosocomial infections are defined as infections acquired during or as a result of hospitalisation. The patients neither have these infections or are incubating these infections on admission. Generally, a patient who develops an infection after 48 hours of hospital admission is considered to have a nosocomial infection. However, some nosocomial infections may not manifest as disease immediately, and can manifest even after discharge.

### 1.3 GOALS AND OBJECTIVES

As stated above, the goal of the hospital infection control programme is to prevent or minimise the potential for nosocomial infections to patients as well as to staff.

The programme will have the following objectives:

1. To develop written policies and procedures for standards of cleanliness, sanitation and asepsis in the hospital.

2. To interpret, uphold and implement the hospital infection control policies and procedures in specific situations.
3. To provide surveillance for nosocomial infections.
4. To review and analyse data on infections that occur, in order to take corrective steps.
5. To develop a mechanism to supervise infection control measures in all phases of hospital activities.
6. To ensure continuing education of employees on infection control aspects.

#### **1.4 INFECTION CONTROL COMMITTEE**

##### **1. Name**

The name of the Committee shall be the Hospital Infection Control Committee (HICC).

##### **2. The nature of authority of HICC**

The hospital infection control programme is to be organised and run by the Medical Superintendent (MS). For the implementation of the programme the MS constitutes the HICC. The HICC is advisory to the MS and shall make its recommendations to the MS. While the MS is the administrative officer concerned with infection control and related activities, the Deputy Chairperson of the HICC will be authorised to act on behalf of the MS in emergency situations. The Deputy Chairperson of the HICC will assist the MS for ensuring that infection control policies are adhered to and all departments maintain correct procedures.

##### **3. Terms of reference of HICC**

The HICC will supervise the implementation of the hospital infection control programme. Specifically, the committee shall:

- (a) Maintain surveillance over hospital acquired infections.
- (b) Develop a system for identifying, reporting, analysing, investigating and controlling hospital acquired infections.
- (c) Develop and implement preventive and corrective programmes in specific situations where infection hazards exist .
- (d) Advise the Medical Superintendent on matters related to the proper use of antibiotics, develop antibiotic policies and recommend remedial measures when antibiotic resistant strains are detected.
- (e) Review and update hospital infection control policies and procedures from time to time.
- (f) Help provide employee health education regarding matters related to hospital acquired infections.
- (g) Shall meet regularly not less than once a month and as often as required.



#### **4. Composition**

The committee will consist of the following:

1. The Medical Superintendent.
2. Deputy Chairperson.
3. Secretary.
4. Joint Secretary
5. Representative of the dept of Microbiology / Virology.
6. Representative of the Medical faculty.
7. Representative of the Surgical faculty.
8. Representative of the Child Health faculty.
9. Nursing Superintendent.
10. General Superintendent.
11. Operation .Room (OR). Supervisor.
12. Central Sterile Supplies Dept. (CSSD) Supervisor.
13. Representative of the Dept of Pharmacy.
14. Epidemiologist.
15. Hospital Infection Control Officer (HICO)

The Deputy Chairperson of the HICC will be nominated by the MS. As the term of the Deputy Chairperson nears completion, the HICC may recommend to the MS the name of a successor. The MS will give due weightage for the recommendation but shall be free to nominate another person for the chair. The respective heads of Depts/divisions shall nominate the representatives of the various depts/faculties. The HICO shall be nominated by the MS and will be a doctor assisted by a nurse.

#### **5. Duties and responsibilities of the committee members.**

##### ***Chairperson & Deputy Chairperson***

1. The Medical Superintendent will be the chairperson of the HICC. He/she may designate a member of the HICC to officiate as Deputy Chairperson for a period of two years.
2. The Deputy Chairperson will submit the name of a prospective secretary. With the approval of the Medical Superintendent, the Deputy Chairperson shall appoint the secretary.
3. The Chairperson or the Deputy Chairperson shall preside over all HICC meetings.
4. The Deputy Chairperson shall:
  - (i) act as liaison between the committee and the hospital administration as and when the need or opportunity arises.
  - (ii) constitute expert committees/subcommittees for specific purposes related to the investigation or control of infection or to antibiotic policies.
  - (iii) receive surveillance reports and other hospital acquired infection related information and assist the MS to initiate appropriate action.
  - (iv) in the absence of the Medical Superintendent, the Deputy Chairperson shall

assume the responsibilities of the MS with regard to the hospital infection control programme.

***Secretary / Joint Secretary***

1. Calls all meetings in consultation with the Chairperson or Deputy Chairperson.
2. Ensures that the minutes of the previous meeting and agenda for next meeting are distributed at least one week prior to the next meeting.
3. Ensures that the committee functions according to the bye-laws.
4. In the absence of the Deputy Chairperson the Secretary shall assume all duties and responsibilities of the Deputy Chairperson.
5. Performs any other responsibilities delegated by the Chairperson / Deputy Chairperson.

***Hospital Infection Control Officer (HICO)***

1. Supervises surveillance of Hospital acquired infection.(HAI)
2. Assists the Medical Superintendent in identifying, reporting, analysing, investigating and controlling hospital acquired infections.
3. Supervises preventive and corrective programmes.
4. Carries out other responsibilities given to the HICO by the MS and activities given by the HICC.

**6. Technical activities of HICC**

The Hospital infection control committee shall have the following functions:

- a. Define nosocomial infections for surveillance purposes, to establish the modus operandi for early identification and reporting of HAI and to determine the prevalence rates of defined infections.
- b. To analyse, interpret and disseminate data arising out of surveillance and to recommend remedial measures and to ensure follow up action.
- c. To establish the ongoing evaluation and review of all aseptic, isolation, and sanitation techniques employed in the hospital. Such techniques shall be defined in written policies and procedures.
- d. To develop written policies, defining the specific indications for patient isolation requirements.
- e. To ensure the proper conduct of sterilisation and disinfection practices and to ensure that the central services, housekeeping, laundry, engineering maintenance, food sanitation, and waste management are in conformity with the hospital infection control policies. The necessary procedures shall be evaluated and revised periodically.
- f. To guide the scope and content of the Employee health programme.
- g. To help in the education and orientation of all new employees as to the importance of infection control and the relevant policies and procedures.
- h. To act upon recommendations related to infection control, received from the administration, departments, services and other hospital committees.



## **2. SURVEILLANCE AND REPORTING OF INFECTION**

### **2.1 INFECTION SURVEILLANCE PROGRAMME FOR HOSPITAL ACQUIRED INFECTION**

Surveillance encompasses collection, collation, analysis, interpretation and dissemination of relevant data related to actual hospital acquired infection (HAI) or the risk for the same. Under the hospital infection control programme, surveillance covers infections and their microbiological causes.

The surveillance for infections acquired in the hospital may be passive or active. Passive surveillance consists of the reporting of any occurrence of suspected HAI by the clinicians. Active surveillance, on the other hand is the systematic collection of data by a designated surveillance team.

#### **Passive clinical reporting of suspected HAI:**

1. Whenever clinicians suspect the occurrence of HAI it shall be reported to the MS or the Deputy Chairperson of the HICC in the nosocomial infection reporting form. Details regarding the patients, all procedures, medications with details of duration, dates etc. should be made available.
2. The Microbiology dept shall be responsible for reporting any information about infections suspected to have been acquired in the hospital.
3. Passive clinical surveillance will be correlated to relevant microbiological information by the HICO and action taken.

#### **Active surveillance of HAI:**

1. The HICO will monitor the rates of HAI in the various units. At present this is restricted to MRSA and multidrug resistant bacterial infections. In case of any increase in the rates or of clustering of cases due to a particular organism, the Medical Superintendent / Deputy Chairperson will assign the task of investigation to the HICO or to a subcommittee. A hospital infection surveillance team is necessary to establish and maintain ongoing active surveillance of all HAI. The recommended team shall consist of the HICO assisted by a senior microbiologist and a nurse.
2. The suggested clinical units for active surveillance include surgical wards, intensive care units, burns care units, neonatal care units and chronic care facilities such as rehabilitation units.

No single standardised protocol is recommended for the investigation of an outbreak of HAI.

### **2.2 REPORTING OF COMMUNITY ACQUIRED INFECTIONS TO GOVERNMENTAL HEALTH AUTHORITIES**

The health care system is broadly divided into preventive and curative services. Traditionally, disease-preventing activities belong to the public health arm of the health services and curative care to hospitals, dispensaries and clinics. When people with

illnesses come to curative services, it is the duty of the HCW to remember that certain illnesses may have public health importance for which reason the public health system should be alerted.

CMCH has the policy to report reportable diseases to the local health authorities. For certain infections, even one case may be of extraordinary importance in the context of present day epidemiology. Every such case has to be considered significant by the public health authorities and immediate steps taken to find further cases and to prevent further infection. Plague and cholera are examples. Certain other diseases are already under surveillance and the earliest evidence of an outbreak can be picked up from the reporting frequency.

Childhood vaccine preventable diseases are reportable since a case is evidence for inadequate immunization in the area of residence of children with such diseases. For the above reasons, reportable diseases should be informed without delay and with complete residential address to the health authorities.

AIDS and HIV infection have recently been included in the list of reportable diseases by government directive. However reporting is only for statistical purposes of determining the time-trend of prevalence. Moreover, strict confidentiality of the identity of the person is to be maintained, hence the report will not contain the identity of the individual.

### **Reporting Methodology**

Although the Medical Superintendent is ultimately responsible for reporting, the reporting process begins from the time of diagnosis, either at the bedside or in the laboratory. Thus, the flow of information will be from the clinicians and microbiologists, to the Medical Superintendent's Office, from where information is reported on a specific format to the Municipal Health Officer (MHO). To avoid delay in transmission of information from the MHO to the deputy director of public health, a copy of the report will also be sent directly to the deputy director of public health .

### **List of reportable diseases**

#### To be reported by laboratories:

##### **Clinical Microbiology**

Anthrax  
Cholera  
Diphtheria  
Enteric fever  
Meningococcal disease  
Plague  
Tuberculosis

##### **Clinical Virology**

HIV

##### **Clinical Pathology**

Malaria

##### **General Pathology**

Tuberculosis



To be reported by Clinicians:

Acute Influenza pneumonia	Measles
Acute flaccid paralysis	Pertussis
AIDS	Rabies
Anthrax	Relapsing fever
Cerebro-spinal fever (Meningitis)	Scarlet fever
Chicken Pox	Small pox
Diphtheria	Tetanus
Enteric fever	Tuberculosis
Influenza outbreaks	Typhus
Leprosy	Viral Encephalitis

Microbiological monitoring of the environment is described in the chapter 'Housekeeping' and also under the individual patient care areas.





### 3. EMPLOYEE HEALTH PROGRAMME

#### GENERAL CONSIDERATIONS

Several surveys of infections in developed countries have shown that occupationally-acquired infections are greatest among some categories of health care workers (HCW) such as medical and technical staff, attenders and cleaners, while such risk is low among secretarial staff. This is essentially because of their potential for coming into contact with pathogens or infected specimens.

The most effective method of preventing occupationally-acquired infections is adopting safe working practices. Immunisation can never be accepted as a substitute for good working practices. Based on a risk assessment of staff, specific protection may be recommended. The assessment takes into account the pathogens they may be exposed to, the local epidemiology of the disease, the nature of specimens/infective material handled, the frequency of exposure/contact with potentially infected material or patient. Staff considered to be at risk will be offered specific protection (largely pre-exposure, and post-exposure, where indicated), including immunisation (wherever possible). IMMUNISATION SHOULD TAKE INTO ACCOUNT THE SAFETY AND EFFICACY OF AVAILABLE VACCINES. For staff who are at low risk, post-exposure prophylaxis may at times be necessary. The workplace also provides an opportunity to protect individuals who have not received immunisation such as tetanus toxoid etc that are universally recommended.

#### 3.1 HEALTH SERVICE

Employees who are in contact with patients have a risk of acquiring infection in their workplace. This can be minimised by following certain guidelines. CMCH has a Staff Students Health Service (SSHS), which is primarily responsible for staff health.

##### **Activities of the SSHS:**

All services provided to individuals by the SSHS will be confidential and the staff of this department will give a signed undertaking to the HOD stating this.

##### **1. Placement evaluation**

When personnel are appointed initially, a medical check-up is performed and baseline data on certain infections are collected. A placement evaluation is made to ensure that persons with special health problems are not placed in jobs that would pose undue risk of infection to them. At this time, the health service also confirms that vaccinations required are complete. If the vaccination is not complete, the SSHS shall advise completion of the vaccine schedule.

##### **2. Employee health & safety education**

Safety education starts at the time of employment. A video programme on universal precautions will be screened and the employee will be expected to secure a certain score in a questionnaire that will follow the video show. All staff are informed of the need to report exposure to blood or potentially infectious body fluids to the SSHS duty doctor without any delay. Other health and safety education will also be carried out as



appropriate.

### **3. Health counselling**

The SSHS will conduct health counselling and offer prophylaxis when required (for example, following accidental exposure to blood or potentially infectious body fluids).

### **4. Work restrictions for staff**

It is the responsibility of the staff to report suspected illness to the SSHS. A major function of the SSHS is to arrange for prompt diagnosis and management of illnesses of personnel, including alerting the heads of departments that could be affected because of this, keeping in mind that confidentiality of the individual concerned should be protected as much as possible. The SSHS shall recommend the exclusion of personnel from specific areas in which direct contact with patients may pose a risk for the HCW or to the patient and also give clearance after the work restriction is terminated.

### **5. Health check up**

The SSHS will carry out an annual health check up for all staff.

## **3.2 SPECIFIC PROPHYLAXIS**

### **1. Pre-employment and upon employment**

According to the national policy, everyone is expected to have had immunization against diphtheria, pertussis, tetanus, poliomyelitis, and measles in early childhood, with boosters for diphtheria, pertussis and tetanus subsequently.

The immunization history of all prospective staff shall be documented by the SSHS. If tetanus immunization is not updated, the SSHS will provide the necessary doses free of cost.

Prospective staff who have not had a full course of hepatitis B immunization will be offered the same upon employment at their own cost. The hepatitis B immune status of staff who claim to have had the vaccine previously will be tested by serology at their cost. Non-immune subjects will be offered immunization as stated above. All staff are informed that accidental exposure to blood or potentially infectious body fluids should be immediately communicated to the SSHS.

All staff are expected to have typhoid fever immunization completed and updated before or upon employment.

Immunisation for all conditions other than the above will be based on a risk assessment of the individual and his/her workplace, by the SSHS. Staff working in different sections of laboratories will have a risk assessment in conjunction with the HOD and appropriate vaccines administered, when available.

### **2. Protocol for managing exposure to blood or potentially infectious body fluids.**

Parenteral (needlestick) exposure to HIV infection is estimated by the CDC, Atlanta, Georgia to have a 0.3% risk of transmission of HIV. This is because of the low concentration of virus in the blood of infected patients. The risk in the case of HBV



infected specimen in similar situations is 5-30%.

### **A. Immediate care**

- For needle-stick injury:
  - ⇒ Briefly induce bleeding from wound.
  - ⇒ Wash for 10 minutes with soap & water, or a disinfectant.
- For non-intact skin exposure:
  - ⇒ Wash with soap & water or antiseptic.
- For mucosal exposure (eg. splash into eyes) :
  - ⇒ Irrigate copiously by running a pint of normal saline over 10 minutes, the eye being held open by another person.

### **B. Reporting**

All sharps injury (break of skin with any sharp instrument such as hypodermic needle previously used on a patient) and mucosal exposure (blood or body fluids coming into contact with eyes, mouth etc.) should be reported to the immediate supervisor and the SSHS, **immediately** following exposure.

All blood and body fluids with visible blood are considered infectious.

Other body fluids may be potentially infectious (see section on Universal Precautions in the chapter 'Prevention of transmission of blood borne pathogens') and must be evaluated on case-to-case basis.

### **C. Management**

Assessing the risk of transmission of HBV or HIV infection :

*For ALL exposures the following investigations need to be done:*

**Index patient** should be checked for the following:

- ◆ HIV antibody
- ◆ HBsAg
- ◆ HCV antibody

**Health care worker:**

After obtaining consent, blood of the health care worker is checked for:

- ◆ HbsAg
- ◆ HIV
- ◆ Anti HBs antibodies .

The blood samples for the investigations listed above are sent for rapid testing. SSHS duty doctor will check the results within 45 minutes.

If the index case is HBsAg positive :

HCW	ACTION
<b>A. HBsAg negative</b> 1. Antibodies >100 MIU 2. Antibody negative or <10MIU 3. Antibody between 10 - 100 MIU <b>B. HBsAg postive</b>	Reassure First dose of HBV vaccine and HBV immuno-globulin (0.6ml/kg - I.M.) * Booster dose of vaccine * Counselling

\* Follow up:- Staff asked to come back for HBsAg testing at 3 & 6 months and for completion of vaccination

As of now, any staff who has been in service for more than three months and not fully immunized (3 doses) will not be eligible for free Hepatitis B Immunoglobulin or vaccine.

The pharmacy will stock Hepatitis B Immunoglobulin at all times.

If the index case is HBsAg negative:

HCW	ACTION
<b>A. HBsAg negative</b> 1. Antibodies >100 MIU 2. Antibody negative or <100MIU <b>B. HBsAg postive</b>	Reassure Vaccination (full or booster as required) Counselling

If the index case is HIV negative or the index case is unknown:

Do not start chemoprophylaxis; consult the head of SSHS or one of the experts. The HCW is offered HIV antibody testing at 0, 6, 12 and 24 weeks.

If the index case is HIV positive and HCW is HIV negative, the protocol given below (modified from MMWR May 1998) is followed.

- ⇒ For Indian setting all HIV positive index patients are to be considered as highly infectious (HIV status code 2 of CDC).
- ⇒ Chemoprophylaxis is best when started within 1-2 hours following exposure. The cut off period for chemoprophylaxis is 72 hours following exposure.



The following investigations are to be done while starting chemoprophylaxis. Do not delay starting chemoprophylaxis for the sake of these investigations.

- ♦ Haemoglobin estimation
- ♦ Platelet count
- ♦ Reticulocyte count
- ♦ WBC-Total & Differential counts
- ♦ Serum creatinine
- ♦ Liver function test
- ♦ Random blood sugar

Categorization of exposures with recommended prophylaxis:

- Use three drugs (Zidovudine + Lamuvudine + Indinavir) for
  - (i) all percutaneous injuries with contaminated sharps
  - (ii) mucous membrane / non-intact skin exposure with large volumes of body fluid for long duration.
- Use 2 drugs (Zidovudine + Lamuvidine) for mucous membrane / non-intact skin exposure with small volume body fluid for short duration.
- If in doubt, start on 3 drugs immediately and consult a senior person as soon as possible.

Drug Regimen:

- 3 drugs - Azidothymidine (Zidovudine) 200 mg thrice daily, Lamuvidine 150 mg twice daily and Indinavir 800 mg every 8 hours. If Indinavir is not available, Nelfinavir 750 mg three times daily is to be used.
- 2 drugs - Zidovudine and lamuvidine.
- Total duration 4 weeks for both

If the index patient is already on anti-retroviral treatment with 1 drug, add 2 new drugs for the staff. The pharmacy will stock all 3 drugs used in chemoprophylaxis at all times.

Follow up of HCW:

The HCW should be tested for HIV antibodies after 6 weeks, 3 months and 6 months following the exposure, irrespective of the HIV status of the index patient.

***D. Counselling***

Counselling of the HCW is performed when necessary

**3. Typhoid fever**

TA vaccine is used routinely; primary immunization consists of two ID fractional doses one month apart and booster doses at three year intervals for the first and second boosters and thereafter at five year intervals. Those who choose the oral or Vi vaccines will have to pay the cost. The intervals between boosters are the same.

#### **4. Tetanus**

Tetanus toxoid will be given to all staff during pre-employment checkup and every ten years at the time of their annual checkup.

#### **5. Rubella**

Rubella vaccination is recommended for all staff at entry, but mandatory for high risk groups such as those working in paediatrics and obstetrics.

#### **6. Varicella**

Varicella vaccine is recommended for staff who do not give a history of having had chickenpox but are working in certain very high risk areas (eg: bone marrow transplant unit).

#### **7. Rabies**

Post exposure prophylaxis will be provided free of cost to the employees. Pre-exposure prophylaxis will be provided free for persons declared as high risk.

#### **8. Anthrax**

No chemoprophylaxis is required for anthrax, for HCW caring for a patient or laboratory worker processing samples with adequate precautions.

#### **9. Other diseases**

In case of exposure to other uncommon and transmissible diseases such as meningococcal disease etc., the incident shall be reported to the SSHS and prophylaxis (e.g. rifampicin for meningococcus) may be prescribed by the SSHS in consultation with the infectious disease physician.



## 4. PREVENTING TRANSMISSION OF BLOOD BORNE PATHOGENS

### 4.1 INTRODUCTION

The occupational risk with blood borne pathogens among health care workers (HCW) has been recognised for a long time. However, it was the emergence of the human immunodeficiency virus (HIV) that highlighted the need to elucidate the epidemiology of occupational blood contact, the risk of infection from blood contact and to formulate strategies to prevent the transmission of blood borne pathogens to HCWs from patients and vice versa. Many countries have developed comprehensive guidelines for prevention of blood borne infection among different categories of HCWs. The known risks from blood borne pathogens and recommended safety precautions to prevent occupational infection among HCWs are reviewed in this section.

### 4.2 THE RISK OF INFECTION

#### **Risk of transmission of infection from patient to HCW**

##### ***Hepatitis B Virus (HBV)***

Numerous seroprevalence studies in developed countries have shown that prevalence rates of past or present HBV infection in the HCWs are three to five-fold higher than in the general population. Cohort studies in the 1970s and early 1980s in the United States, before widespread use of hepatitis B vaccine in HCWs, showed an annual rate of infection among HCWs of 0.5% to 5%, compared to 0.1% in the general population. It is estimated that in 1994, 1012 HCWs in the United States became infected with HBV and approximately 22 of them will eventually die of the acute and chronic consequences of the infection. These rates represent a 57% decrease over rates prior to the widespread use of vaccine and Universal Precautions. Thus, in regions such as India where these precautions are not rigorously followed and the prevalence of infection in the general population is much higher than in the United States, infection and mortality among HCWs from HBV are likely to be much higher.

The commonest mode of transmission of infection from patient to health care worker is percutaneous injury from a sharp object contaminated with infected blood. The rate of transmission of HBV infection by percutaneous injury is estimated to be 30% from a HBsAg and HBeAg positive patient and 6% from a HBsAg positive but HBeAg negative patient.

There is very limited information on the prevalence of HBV among HCWs in India. The frequency of HBsAg positivity, indicating mainly chronic infection and not prevalence of recent or past infection as shown earlier for developed countries, in different centres in India ranged from 0.6% to 16.5%. In a study in Delhi, the rate of HBsAg positivity among high risk HCWs was 13.2% compared to 3.6% among the general population.

##### ***Hepatitis C Virus (HCV)***

HCV is a RNA virus in the flaviviridae family. Exposure to blood is the major mode of transmission. The rate of HCV transmission via a needle stick injury is estimated to be 10%. Of patients infected with HCV, fewer than 25% have acute hepatitis. However,



almost all of those who have acute hepatitis develop chronic infection. Follow up studies show that 26%-50% of those infected with HCV develop chronic active hepatitis and 3% to 26% go on to develop cirrhosis.

Data on seroprevalence of HCV infection among HCWs is limited. Available data shows seroprevalence rates of 0% to 1.7%. In a study among dentists and oral surgeons in New York City, the rates of anti-HCV antibody among oral surgeons, other dentists and the general population (blood donors) were 9.3%, 0.97% and 0.14%, respectively. There is no available data of prevalence of HCV infection among HCWs in India. However, rates of HCV infection among voluntary blood donors in Delhi was close to 1%, a rate substantially higher than that reported in the United States. Hence, risk of infection among HCWs in India is likely to be higher than that reported in the United States.

### ***Human Immunodeficiency Virus (HIV)***

The most comprehensive data on prevalence of HIV is from the United States of America. Seroprevalence surveys among orthopaedic surgeons and general surgeons who reported appreciable blood contact, including blood from HIV-infected patients have shown extremely low rates of sero-positivity; the majority of those who tested positive had non-occupational risk factors for infection.

The average risk of seroconversion among HCWs who had occupational exposure to blood from an HIV-infected patient, based on prospective follow up of over 3600 subjects, was 0.3%; nearly all seroconversions occurred after percutaneous injury with a hollow bore needle. In vitro studies have shown that injuries with solid suture needles result in inoculation of 50% less blood than hollow needles of the same gauge. These studies also showed that one layer of surgical gloves reduced the volume of blood injected by solid needles by 70% or more and a second layer of gloves resulted in a further 50% reduction in the amount of blood injected; the magnitude of reduction was less with hollow bore needles.

The risk of transmission of HIV from mucous membrane exposure is considerably less than with percutaneous injury. Data from prospective studies have documented only 1 seroconversion from 1107 mucous membrane exposures (0.09%).

### **Risk of transmission of infection from HCW to patient**

There are many instances of transmission of HBV infection from HCWs to their patients. Most instances of transmission occurred when universal precautions were not followed, though in some instances transmission has occurred despite universal precautions. Thus, the use of Universal Precautions not only prevents infection from patient to HCW but also prevents transmission of infection in the reverse direction.

The only reported instance of transmission of HIV from a HCW to patients involved a dentist. The exact mode of transmission in this case, where 5 of 1100 patients treated by one dentist were found to be infected, is not known. The dentist was known to use recommended precautions. Other than this one instance, transmission from HCW to patient has not been documented. Follow up of 22,171 patients of 51 HIV-infected HCWs, including dentists and dental students have not documented any transmission of HIV.



### 4.3 RECOMMENDATIONS

#### A. Vaccination

The most important approach for the prevention of occupational HBV infection is the use of hepatitis B vaccine among HCWs. The currently available vaccines are safe and highly effective in preventing infection. Over 90% of adult recipients respond to the vaccine with protective levels of antibody. Ongoing cohort studies suggest that the protection lasts for at least 13 years. Therefore, testing to determine antibody persistence and booster vaccinations are not routinely recommended.

However, vaccines are currently not available for other blood borne pathogens, including HCV and HIV. Therefore, prevention primarily consists of taking adequate barrier precautions to prevent transmission. With HIV, post-exposure chemoprophylaxis may reduce, but not completely prevent, transmission of infection.

#### B. Universal Precautions

##### *Rationale:*

In 1983, guidelines were published for prevention of transmission of infection from patients suspected to be infected with blood borne pathogens. These precautions were termed "Blood and Body Fluid Precautions". It was soon realised that the majority of patients infected with HBV, HCV or HIV were asymptomatic and that the infection status of most patients would be unknown at the time of presentation. This realization led to the recommendation that the category of blood and body fluid precautions be applied to ALL patients, a concept known as Universal Precautions. The term "Universal Precautions" refers to all patients. It is procedure based and not person based.

There is an erroneous impression that Universal Precautions are cumbersome and expensive and not practical in countries with limited resources. However, if one closely scrutinises the recommendations for Universal Precautions, they are relatively simple. The precautions to be taken vary with the degree of anticipated exposure. In most instances this only means the use of gloves for all patients where contact with blood or body fluids is anticipated. Masks and eyewear are only required when a splash is anticipated. More rigorous barrier precautions are only required in certain surgeries where massive exposure to blood or body fluids is anticipated. Even when they are uniformly applied for all patients, these precautions are less expensive and more effective than universal testing of all patients for infection with selected blood borne pathogens and use of precautions in only those who test positive. Most cases of transmission of infection, at least of HIV, take place outside the setting of the operating room and pathogens such as HCV are much more transmissible than HIV, and equally dangerous.

##### *What fluids are potentially infectious?*

The Centres for Disease Control considers the following body fluids as potentially infectious: blood, semen, vaginal fluid, cerebrospinal fluid, synovial fluid, peritoneal fluid, pleural fluid, pericardial fluid, amniotic fluid, saliva in dental procedures, breast milk in breast milk banking procedures, any body fluid that is visibly contaminated with blood, all body fluids in situation where it is difficult to differentiate between body fluids and all unfixed tissue or organs from humans.



Universal precautions may not apply to the following unless they contain visible blood: faeces, urine, saliva, nasal secretions, sweat, tears, vomitus and human breast milk.

***Cardinal rules of universal precautions:***

- ➔ Consider all **patients** potentially infectious.
- ➔ Assume all **blood and body fluids and tissue** covered by Universal Precautions are contaminated with a blood borne pathogen.
- ➔ Assume all unsterile needles and other **sharps** are similarly contaminated.

***What does one need to do?***

1. Hand washing

Hands should be washed if contaminated with blood or body fluids and after removing gloves. HCWs with exudative or weeping dermatitis should refrain from direct patient care or handling patient care equipment. For more details on hand washing, please refer to the chapter 'Techniques'.

2. Personal protective equipment

All HCWs should routinely use appropriate barrier precautions when exposure to blood or potentially infected body fluids is anticipated.

*These include:*

- ✓ Use of GLOVES for contact with blood, potentially infectious body fluids, mucous membranes or non-intact skin in ALL patients. Gloves should also be used for handling items or surfaces soiled with blood or body fluids and for performing venipuncture or other vascular access procedures. Gloves should be removed before leaving the patient's bedside.
- ✓ MASKS and protective EYEWEAR should be used for procedures likely to generate droplets of blood or body fluids that could lead to contamination of eyes, nose or mouth.
- ✓ Appropriate protective clothing such as GOWNS, APRONS, SURGICAL CAPS and IMPERVIOUS SHOES should be worn if there is a risk of exposure. The type and characteristics of protective attire to be worn will depend on the task and degree of exposure anticipated. All protective clothing and equipment must be properly discarded or decontaminated before leaving the work area.

3. Proper disposal of needles and sharps

Needles and sharps are the commonest mode of transmission of blood borne pathogens to HCWs. Precautions should be taken to prevent injuries by sharp instruments, especially hollow bore needles that have been used for venipuncture or other vascular access procedures.

- ☠ **Needles should not be recapped**, bent or broken by hand. Disposable needles, and other sharps should be disposed immediately after use into puncture resistant containers, which should be located at the site of the procedure.
- ☠ If a needle has to be removed from a syringe, use forceps or do it with utmost care.
- ☠ **Do not overfill a sharps container.**



#### 4. Disinfection of equipment

Reuse instruments, tubings, etc only after decontamination and sterilisation or decontamination, as appropriate (Refer to the chapter on Sterilization and disinfection)

Do not touch equipment with soiled gloves or gloves used for patient care. Surfaces of large equipment should be disinfected with a 1:100 dilution of bleach or sodium hypochlorite or an approved disinfectant. Heavily soiled equipment may require additional cleaning with detergent and water. Gloves must be worn while cleaning the equipment.

#### 5. Waste disposal

Items soiled with blood, bloody drainage or potentially infected material must be placed in the yellow biohazard plastic bags. Double bagging is not necessary. Items that may tear the bag must not be placed in the plastic bag. For further details, please refer to the section on 'Waste disposal'.

Excreta, blood or body fluids must be emptied down the drain with adequate amount of water.

#### 6. Linen

Linen soiled with blood or potentially infectious body fluid must be soaked in lysol for 60 minutes, placed in a leak proof bag and then sent to the laundry.

#### 7. Spill cleanup

Cover spills of blood or body fluids with Dakins solution or a 1:10 to 1:100 dilution of freshly prepared sodium hypochlorite or household bleach for 10 minutes. Then mop dry. A second decontamination may be done if required. Wash the area with detergent and water. Gloves must be worn during cleanup and decontamination procedures.

No environmentally mediated transmission of HIV has been documented to date.

*Details of precautions taken in certain areas eg: operation theatre, labour room, transplant units, etc are described later (refer to the chapter 'Specific areas of patient care').*

### **C. Post Exposure Prophylaxis**

For details of management after accidental exposure to blood or potentially infectious body fluids, please refer to the section on 'Post exposure prophylaxis' in the chapter 'Employee Health Programme'.

## **4.4 RECOMMENDATIONS FOR PATIENTS KNOWN TO HARBOUR BLOOD BORNE PATHOGENS**

### **Instructions for wards**

#### 1. Admission:

Patients with HIV disease but presenting with unrelated illnesses may be admitted in any ward as per existing rules. Patients with AIDS requiring isolation on account of

secondary infectious diseases will be isolated as recommended (see the chapter on isolation policies and procedures). Confidentiality shall be maintained with appropriate precautions to prevent nosocomial transmission.

2. Preparation of the patients:

It is the responsibility of the attending physician to ensure that patients testing positive are informed about the result and receive counselling (either by the attending physician or in the infectious disease clinic). Results of the HIV test must be kept strictly confidential. When information on HIV status needs to be shared with a member of the family, the patient's consent should be obtained. This does not apply to young children or those with dementia / deficient sensorium.

The nursing staff will explain to patients, attendants and visitors (when necessary), the purpose and methods of handwashing, body substance and excreta precautions, and other relevant precautions.

3. Red bag (Reusable non-sharp material):

The ward sister must ensure that the prescribed red bag is obtained from CSSD when a patient with HIV, HBV or HCV infection is admitted. All contaminated items that are to be sent to CSSD for disinfection are placed in the red bag and sent for autoclaving. After autoclaving, the red bag is brought back to the ward, where the bag is opened, contents sorted and sent to CSSD for sterilization along with other items. **Sharps are not to be discarded into the red bag.**

4. Specimens:

Adequate precautions are to be taken while collecting specimens. The specimens are to be transported in leak-proof containers placed inside a leak-proof plastic cover. Ensure that the cover and the outside of the container are not contaminated. Attach a 'Biohazard' label.

5. Waste disposal:

A bin lined by a yellow plastic bag is placed in the patients room for infectious waste. When the bag is 3/4ths full it is placed in a cardboard box, sealed with adhesive and sent for incineration.

Non-infectious waste does not require special precautions and is disposed in a manner similar to non-infectious waste generated from any other patient.

Sharps are discarded into the sharps container.

(Refer to the section on waste disposal for more details.)

6. Death of a patient:

Nursing staff must inform the Pathology duty doctor before sending the body to the mortuary. Those cleaning the body should use gloves and other protective gear. Before leaving the ward, the body is bagged as for any case.



## 5. TECHNIQUES

This section deals with techniques that are followed in many patient care areas. They are:

- |                  |                 |  |
|------------------|-----------------|--|
| 1. Handwashing   | 3. Use of Gowns | 5. Injections                          |
| 2. Use of gloves | 4. Use of Masks | 6. Collection & transport of specimens |

### 5.1 HANDWASHING

Handwashing is the most important procedure for preventing nosocomial infections. When done with plain soap, it results in mechanical removal of microorganisms, and if done with detergents containing antimicrobial agents, it results in chemical removal of microorganisms as well.

#### **Handwashing must be done positively:**

- ▶ Before performing invasive procedures
- ▶ Before caring for particularly susceptible patients (newborns, immunocompromised and other reverse isolation category patients. Refer to the chapter 'isolation policies and procedures')
- ▶ Before and after touching wounds, even if gloves are used.
- ▶ After dealing with situations during which microbial contamination is likely, even if gloves are used.
- ▶ On joining and completion of duty shift
- ▶ Between handling of patients and between procedures on the same patient.
- ▶ After handling contaminated articles like urinals, bed pans etc.
- ▶ After personal use of toilet and before and after meals.

#### **General handwashing Technique:**

- Remove watch and other jewellery, stand well away from the sink, turn on the tap using the elbow, wet hands from finger tips to elbow, holding up to enable water to run down from the finger to the elbow.
- Apply soap and scrub each hand with the other, using rotatory movements from the finger tips to the elbows, with special attention to the nails and webs of fingers.
- At the start of the shift, a 2-minute scrub is considered the shortest acceptable duration for handwashing. A 30-second scrub should be done in between patients who are not grossly contaminated. If grossly contaminated, a 60-second scrub is recommended.
- Rinse thoroughly under running water ensuring that water flows from the finger tips to the elbow.
- Close tap with elbow, taking care not to touch any spot that has been scrubbed.
- Dry with a clean towel beginning with the hands and proceeding to the wrists and then to the forearms.
- Hot air or disposable paper towel can also be used for drying (except when preparing for invasive procedures)

## **Handwashing in Special Areas/Units**

### Intensive Care Unit & Nurseries:

Patients in these areas are at a higher risk of infection. Therefore importance of handwashing cannot be over emphasised. Procedure as described above is followed.

### Operating theatres:

Strict aseptic techniques are to be followed by all personnel involved in surgical procedures.

- A minimum of 5 minutes scrub is recommended before each operation. After the preliminary wash of both hands with soap and water, with the hands held up, scrub the hands with sterile brush and soap, starting at the finger nails, hands and proceeding over the forearm to the elbow. Ensure that once the brush has been used over the wrists and forearm, that it is not used over the finger tips and palms. This is to avoid recontamination of the scrubbed parts with flora from forearm.
- Particular attention is given to the finger nails. All personnel should be advised to keep nails short and while scrubbing, the undersurface of the nails should be cleaned.
- Drop soap into tray, and brush on to the ledge, then rinse hands with running water. Keep arms with fingers held up and elbow down to ensure flow of water from the finger tips to the elbow.
- Close tap with elbow.
- As an additional precaution, povidone iodine is applied on both hands and washed off with water after about 1 minute
- Proceed to dry hands with a sterile towel. Mop dry one hand and forearm with one section of towel, then open, fold and mop dry other hand with a different part.

It is essential that once scrubbing has started, all efforts be made to avoid touching contaminated articles/surfaces.

### Isolation wards/units:

The general principles of handwashing before and after each shift, between patient contact and after attending to personal toilet are to be observed. Emphasis is placed on the need for extreme care. Handwashing in between and especially after handling soiled articles, cleaning up patients and administering to isolation patients requires a mandatory 60 seconds scrub.

## **5.2 GLOVES:**

There are two categories of gloves available in the hospital:

- *Examination gloves:* These gloves are clean but not sterile. They are used for all procedures that do not require sterile technique.
- *Sterile gloves:* These are used for all procedures where sterile technique is mandatory. Each pair of gloves is supplied in sealed covers.



**Gloving technique for sterile gloves:**

Pairs of sterile gloves are packed in such a way as to facilitate handling without touching the outside of the gloves with bare hands. A 2" cuff is folded on each glove. There are two methods of gloving:

1. The 'Open' method
- 2 The 'Closed' method

***Procedure for wearing gloves*****A. Powdering:**

1. The packet containing the gloves is first peeled open.
2. Pick up the powder packet from the right hand glove and powder both hands away from the sterile field. This is to avoid risk of accidental spilling of powder over sterile gloves.

**B. 'Open' Method:**

1. Pick up the first glove by gripping its cuff with one hand and slip the other hand in.
2. With the gloved hand, pick up second glove by slipping hand under the cuff (outside of the glove) and slip the ungloved hand in and release the grip.
3. At this stage adjust the fingers of the gloves properly.
4. If gowned, the cuff of the second glove is pulled over the stockinette sleeve of the gown.
5. The cuff of other glove is then pulled over the stockinette sleeve.

**C. 'Closed' Method:**

1. The hands are not pushed beyond the stockinette cuffs of the gown.
2. The cuff of the left hand glove is grasped through the stockinette part of the right sleeve.
3. The left hand is inserted into the glove and the glove grasped by the right hand is pulled over the left hand.
4. After stretching the cuff, the glove is pulled over the sleeve, and the hand is forced through the stockinette cuff in to the glove.
5. The second glove is put on in a similar manner except that the cuff can be grasped with the already gloved hand and the right is forced through the stockinette cuff into the glove. Glove powder can cause irritation and induce postoperative adhesions between intestinal loops and the wound. Hence it should be wiped off with a sterile wet mop.

*There is no strict protocol for wearing unsterile (examination) gloves.*

***Removal of Gloves (for both types of gloves):***

1. To prevent outer surface of gloves from contaminating hands, the gloved fingers of one hand grip the outer surface of the cuff and pull off the glove inside out.
2. To prevent contamination of the ungloved hand, the inside of the cuff of the

opposite glove is held and pulled off the hand.

3. Gloves are discarded into the designated container.

### 5.3 GOWNS

Gowns are available as different types:

*Isolation gowns:* These gowns are clean but not sterile. They are used while handling patients who require isolation. These prevent transmission of infection from the patient to the health care worker.

*Surgical gowns:* They are sterile gowns that are used for aseptic procedures.

*Plastic aprons:* They are used whenever spills are expected. They prevent fluids from soaking the clothes of the health care worker.

#### **Gowning Technique (For sterile gowns)**

Sterile gowns are always folded inside out to avoid contamination. As it is impossible to render the hands sterile, they must not come in contact with the outside of the gown or gloves.

#### **Procedure:**

Hands must be washed thoroughly

1. Pick up the gown holding it well away from the trolley and your own body.
2. Hold the neck band and unroll until the sleeves are seen.
3. Slide both hands and arms into the sleeves at the same time.
4. The floor nurse/assistant slides her hands under the gown at the shoulder and pulls out and fastens all the back tapes.
5. Cover the back with the back flap with the help of the scrub nurse.

#### **Remember:**

- ➡ Do not keep the hands lower than the waist line
- ➡ Do not keep the hands near ones neck or shoulder
- ➡ Do not touch the axillary area once gowned.
- ➡ Do not touch the back of the gown.

#### **Removal of Gown at the end of the Procedure**

1. The circulating nurse will unfasten the gown.
2. The gown is carefully removed by the scrub nurse leaving the gloves on.
3. The gown with the inside folded out is placed in the appropriate bin.
4. The gloves are then removed by holding the inside of the cuff and placed in appropriate container.



## 5.4 MASKS

The traditional mask of four to six layers of muslin offers very limited protection. When first worn it may be reasonably efficient, but soon becomes saturated with moist vapour from the wearer's breath.

More efficient masks are of high filtration disposable type. Several brands are available, any may be used. These masks can be moulded to facial contours and actually filter the respiration as compared to deflection with paper or cellophane insert masks. Such masks achieve 98 percent efficient filtration compared with only 40 percent with muslin mask.

### *Procedure for using a mask*

1. When wearing the mask, care should be taken to see that the nose, mouth and facial hair are well covered
2. Masks should be changed at least every operating session and should never be worn "around the neck"
3. Mask 'wiggling' is also a potential source of infection.
4. When removing a mask, care should be taken to avoid touching the part which has acted as the filter. The hands can easily become contaminated with bacteria.

## 5.5 INJECTIONS

### **Handling sterile syringes and needles:**

The sterile syringe pack is unrolled taking care to touch only the end of the plunger first. The plunger is inserted into the barrel and the assembled syringe is then taken out of its sterile cover. The tube containing the sterile needle is held horizontally and the cotton plug is removed. Then the hub of the assembled syringe is placed at the mouth of tube. The needle is manipulated into the hub through the tube and then tightened by holding the needle only. The plastic needle guard is then removed.

The vial's metal top is removed and the rubber cork is cleaned with a spirit swab before injecting/withdrawing fluid with a needle. The used needle for withdrawing medicine, usually 20 G needle, is then changed before injecting a patient. Never use the same syringe again once unsterile, until it has been sterilised in CSSD.

While loading and administering the medicine, do not to handle / touch the body of the plunger.

After administering the medicine, **do not recap the needle** to avoid needle stick injury. Remove the needle by holding the hub only and drop the disposable needle directly into the sharps container.

Flush the used reusable syringe with disinfectant solution. Discard the syringe without flushing, if disposable.

Syringes & needles for reuse are placed in separate containers with soap and water solution or disinfectant. Rinse the syringe in the same solution, remove the plunger from the barrel and then place them in the container.

Use gloves while sorting syringes and needles. Handle with extreme care, to avoid



accidental injury. Before sending the unsterile syringes and needles to CSSD, the air solution is drained directly into the sink and the needles and syringes are dropped separately on a towel. The reusable needles are arranged holding the hub only.

**Policy for Multiple dose solutions:**

The person administering a multiple dose medication must read the label on the container to confirm that the medication is intended for multiple use.

Solutions used for injections can be left open for a maximum of one day only.

It is the responsibility of the person using a multiple dose solution to determine its safety for future use based on any perceived compromise to the solution's sterility. If breaks in technique have occurred, the solution must be discarded.

**Do not use the same needle to load the solution for different injections. A fresh needle must be used for loading the solution and another fresh needle should be used for injecting the solution every time.**

After loading the solution for one injection, remove the needle from the vial and discard it in the sharps container.

**IV Fluids:**

As IV fluids can be a source of organisms, the following guidelines for use of IV fluids are recommended.

All old stock of IV fluids are to be used before a new batch is used.

The expiry date should be checked before connecting the bottle for use.

Do not reuse bottles that have been used previously. Discard after single use, even if some fluid remains in the container.

Do not puncture bottles with needles to create airways

The bottle must be carefully checked for damage and for leaks before use

If there are visible contaminants in the bottle, do not use the IV fluid. Send the bottle to the microbiology department for culture, inform the pharmacy so that the particular batch of IV fluids can be withdrawn & inform the Hospital Infection Control Officer.

## **5.6 COLLECTION AND TRANSPORT OF SPECIMENS**

### **a. Specimens for general investigations:**

Adequate precautionary measures are to be followed while collecting any specimen for investigations. (Refer to 'Universal precautions' under the chapter on preventing transmission of blood borne pathogens)

For skin disinfection before drawing blood, cleaning with 70% alcohol is adequate.

All specimens should be transported in covered, leak proof containers. Use appropriate carriers for transportation. Lab request forms should not be soiled with liquid specimens.



**b. Specimens for culture:**

All specimens for culture for etiological diagnosis must be taken before institution of antimicrobial therapy. However, therapy should not be delayed unnecessarily. For each specimen the appropriate container must be used and spillage must be avoided during collection, containerisation and transportation. All specimen containers should be labelled with the name and hospital number of the patient. Specimens from patients with suspected blood borne pathogens or other highly infectious organisms, should be placed in plastic bags and should bear the biohazard label. Specimens should be transported to the laboratory immediately after collection. If delay is inevitable, some specimens can be kept at 4 – 8°C. Check with the laboratory regarding this. Blood for cultures should be incubated and never refrigerated, once it is inoculated into the medium.

**1. Blood :**

- i) Draw under strict aseptic conditions.
- ii) Prepare skin as for minor surgical procedures. Ensure povidone-iodine is applied from the centre to the periphery. Allow a contact time of three minutes. Alternatively 70% alcohol (spirit), tincture iodine, and spirit sequence may be used. After the needle is withdrawn, open the adhesive of one culture bottle and inject 5 ml blood into it; then open the adhesive of the second bottle and inject 5 ml. Immediately after inoculation close the bottles with the same adhesive. Ensure that only the tip of the adhesive is touched with the finger.

**2. CSF and Body fluids such as ascitic, joint, peritoneal, and pleural:**

Collect the specimens in sterile containers provided for this purpose, with aseptic precautions.

**3. Ear, nose & throat swabs:**

Take two swabs of specimen and place in one sterile tube. It is not necessary to wet the swabs with saline or distilled water.

**4. Faeces:**

Place small quantity of faeces in a sterile, wide mouthed faeces bottle. Close tightly with screw cap.

**5. Miscellaneous Specimens: (ulcer exudate, swabs from wounds, burns, cervix, vagina etc.)**

Do not apply antiseptic solution before taking the specimens.

Place 2 swabs of specimen in a sterile test tube.

Send additional swabs when multiple examinations are requested.

**6. Pus:**

- a) Place 1-2 ml pus in a sterile test tube. If this is not possible, take as much as possible on 2 sterile swabs and place in a sterile test tube.
- b) Send sufficient material in separate containers for multiple examinations (e.g. M.tuberculosis, anaerobes, fungi).

**7. Sputum:**

- a) Collect an early morning, coughed up specimen after rinsing the mouth with plain water.
- b) Place 5-10 ml specimen into sterile screw cap bottle and send to the laboratory within 30 minutes. If there is delay, refrigerate and send within 1 hr.

**8. Urine:**

Midstream clean catch sample is obtained.

Suprapubic aspiration is a better method for collecting urine for culture, but is invasive. Use a 24 gauge 2 ½" needle (longer than the usual needle) for this purpose.

**Transportation of specimens**

All specimens should be transported in covered containers. **Laboratory request forms and the outside of the container should not be soiled** with liquid specimens. If soiling has occurred, discard and collect another sample.



## 6. CARE OF SYSTEMS AND INDWELLING DEVICES

This section deals with vascular, respiratory and urinary care of patients with indwelling devices. Wound care is also included in this section, because similar principles are involved.

### **General guidelines to be followed for all procedures:**

1. Handwashing is mandatory before, after and in-between procedures and patients.
2. Adhere to strict universal precautions while caring for any of the indwelling devices.
3. Follow proper waste segregation & disposal after each procedure.

### **6.1 VASCULAR CARE**

**In addition to the general guidelines listed above, the following points apply to all intravascular catheters.**

#### ***Handwashing***

Wash hands before every attempted intravascular catheter insertion. Antimicrobial handwashing soaps are desirable, and are preferred before attempted insertions of central intravenous catheters, catheters requiring cutdowns, and arterial catheters.

#### ***Preparation of skin***

Povidone-iodine (PVP) or 70% alcohol may be used for cleaning the skin. Insertion sites should be scrubbed with a generous amount of antiseptic. Beginning at the centre of the insertion site, use a circular motion and move outward. Antiseptics should have a contact time of at least 30 seconds prior to catheter insertion. Antiseptics should not be wiped off with alcohol prior to catheter insertion.

#### ***Applying dressings***

Sterile dressings should be applied to cover catheter insertion sites. Unsterile adhesive tape should not be placed in direct contact with the catheter-skin interface.

#### ***Inspecting catheter insertion sites***

Intravascular catheters should be inspected daily and whenever patients have unexplained fever or complaints of pain, tenderness, or drainage at the site for evidence of catheter related complications. Inspect for signs of infection (redness, swelling, drainage, tenderness) or phlebitis and also palpate gently through intact dressings.

#### ***Manipulation of intravascular catheter systems***

Strict aseptic technique should be maintained when manipulating intravascular catheter systems. Examples of such manipulations include the following:

- Placing a heparin lock
- Starting and stopping an infusion
- Changing an intravascular catheter site dressing
- Changing an intravascular administration set

### ***Flushing IV lines***

Solutions used for flushing IV lines should not contain glucose, which can support the growth of microorganisms. Do not reuse syringes used for flushing. One syringe is used for flushing only one IV line once.

## **1. Peripheral IV sites (short term catheters):**

### ***Dressing changes***

Peripheral IV site dressings should not usually require routine changes, since peripheral IV catheters should be removed within 72 hours.

### ***Use of latex rubber bungs***

Clean the bung using sterile swabs and spirit two times a day and before each injection. Hold the catheter end with sterile gauze while injecting.

### ***Replacement of Peripheral IV Catheters***

Peripheral IV catheters should be removed 72 hours after insertion, provided no IV-related complications requiring catheter removal are encountered earlier. A new peripheral IV catheter, if required, may be inserted at a new site.

## **2. Central intravascular catheters (long term catheters)**

### ***Dressing changes***

Central IV catheter dressings should be changed every 72 hours.

### ***Replacement of central IV catheters***

Central IV catheters do not require routine removal and reinsertion. The catheter can be kept for a maximum of 3 months, provided there is no sign of catheter related infection or other complications.

## **3. Catheter related infection**

At the time of catheter removal, the site is examined for the presence of swelling, erythema, lymphangitis, increased tenderness and palpable venous thrombosis. Any antimicrobial ointment or blood present on the skin around the catheter is first removed with alcohol. The catheter is withdrawn with sterile forceps, the externalised portion being kept directed upward and away from the skin surface.

After removal, the wound is milked in an attempt to express purulence. For 5.7 cm catheters, the entire length, beginning several millimeters inside the former skin surface catheter interface, is aseptically cut and sent for culture. With longer catheters (20.3 cm and 60.9 cm in length), two 5-7 cm segments are cultured: a proximal one beginning several millimeters inside the former skin catheter interface; and the tip. Catheter segments are transported to the laboratory in a sterile tube.

Silicon rubber bungs are preferred when catheters require capping. These are available in the pharmacy.

Three way with extension should be used only when multiple simultaneous infusates or CVP monitoring are required.



## 6.2 RESPIRATORY CARE

In addition to the general guidelines that are to be adhered to, the following should also be noted with regard to respiratory care:

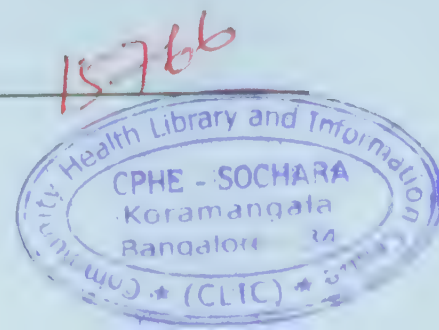
Mouth flora influences development of nosocomial pneumonia in ventilated patients. Frequent chlorhexidine mouthwashes minimise the chances of pneumonia.

### i) Ventilator

- ▶ Sterile water is to be used in nebulizers and humidifiers. This should be replaced once or twice a day.
- ▶ Pneumatic circuits (masks, Y connection and tubes) are to be changed every 24-48 hours. Condensate in tubing should not be drained into the humidifier or airway as they contain large numbers of pathogenic organisms. This should be drained only into water traps. Use disposable circuits if cost permits.
- ▶ Use heat and moisture exchanging filter (HMEF) at Y connection for all patients if feasible and cost permits. Heat and moisture exchanging filter (HMEF) is to be changed every 24-48 hours. It should not be removed from circuit except at the time of changing.
- ▶ All reusable equipment needs to be adequately cleaned between patients by washing with running hot water (soap is used if necessary). If still soiled, they are immersed for 2 hours in hydrogen peroxide solution. This is especially important for corrugated tubings used as part of the pneumatic circuit, as they are difficult to clean. Once cleaned, they are to be disinfected by immersing them in 2% glutaraldehyde for 8 hours. Care should be taken to ensure that the tubings are **fully immersed** in the disinfectant.
- ▶ Oxygen masks, venturi devices and nebuliser chambers are cleaned carefully and then disinfected by immersing in 2% glutaraldehyde for 8 hours.
- ▶ Items that are disinfected with glutaraldehyde are then washed with adequate amount of water to remove the glutaraldehyde.
- ▶ Humidifier domes are autoclaved. Ambu bags are cleaned thoroughly and are then sent for ETO gas sterilisation.
- ▶ Although routine microbiological surveillance of respiratory therapy equipment is NOT required, it is practised in our hospital. It is, however, necessary for the epidemiological evaluation of an outbreak.

### ii) Tracheostomy Care

- ▶ The patient with a tracheostomy is at risk for nosocomial pneumonia since this procedure bypasses the nasopharyngeal defense mechanisms.
- ▶ Tracheostomy should be an elective procedure. This procedure should be done in an operating room, under sterile conditions, unless there are strong clinical indications for an emergency or bedside operation. Sterile technique must be used at the bedside.
- ▶ Careful attention to post-operative wound care is mandatory.





- ▶ The patient should receive aerosol therapy to prevent desiccation of the tracheal and bronchial mucosa or the formation of crusts. The skin around the tracheostomy tube should be cleaned with betadine (Povidone-iodine 5%) every four hours or more frequently if necessary.
- ▶ In the case of metal tracheostomy tubes, the inner canula should be cleaned every four hours and more often if necessary to prevent the formation of crusts. The inner canula is cleaned with water, immersed in hydrogen peroxide for 15 minutes and then rinsed with fresh & sterile normal saline. The plastic tracheostomy tubes are removed, another plastic tube is inserted and the tube is cleaned with hydrogen peroxide and rinsed well before reuse.
- ▶ The tracheostomy tape securing the tube should be changed every 24 hours. This tape must be tied securely at all times.
- ▶ The first complete tube change should be performed no earlier than 4-5 days to allow time for the tract to be formed. Subsequent changes should be done weekly or as necessary.
- ▶ Clean technique should be used to change the tracheostomy tube unless there is a medical indication for sterile technique.
- ▶ The obturator should be at the bedside (preferably taped to the head of the bed) to be used if the tracheostomy tube accidentally is dislodged or is removed for any reason.

### **iii) Suctioning of endotracheal / tracheostomy tube**

Suctioning of the tracheostomy should be done frequently to insure that the airway is free of secretions. However, too frequent or excessive suctioning may irritate the tracheobronchial tree. Employees should be instructed and supervised by trained personnel in proper technique before performing this procedure on their own. Assess the patient using auscultation, ECG, (if available) and vital signs prior to suctioning.

#### **a. Sterile Suctioning**

1. Wash your hands.
2. Use a catheter with a blunt tip.
3. The wall suction should be set no higher than 120 mm Hg for adults and between 60 and 80 mm Hg for children.
4. Attach the suction catheter to the suction tubing; do not touch the catheter with the bare hand (leave it in its protective covering).
5. Put on sterile gloves. The wearing of a mask is also strongly recommended.
6. If it is necessary to instill saline, instill ½ cc of sterile saline into the tracheostomy tube on inspiration only.
7. If on a respirator, pre-oxygenate the patient by connecting the resuscitation bag to the artificial airway and ventilating the patient with three or four deep breaths. A mechanical ventilator, on 100% oxygen, may also be used by depressing the 'manual ventilation' button three or four times.



8. Insert the catheter gently through the inner canula until resistance is met. Do not apply suction during insertion.
9. Withdraw the catheter approximately 1 cm. and institute suctioning.
10. Carefully withdraw the catheter, rotating it gently between the thumb and forefinger applying intermittent suctioning.
11. Continuous suctioning for longer than 10 seconds may create an unacceptable level of hypoxia.
12. The patient should be given time to rest between suctioning episodes. If possible, this time should be from two to three minutes. If the patient is receiving oxygen or ventilatory support, reapply the oxygen or ventilator for at least two minutes before re-suctioning.
13. Observe for unfavourable reactions such as increased heart rate, hypoxia, arrhythmia, hypotension, cardiac arrest, etc.
14. If oral suctioning is necessary, it should be done after the tracheostomy is suctioned. Preferably different catheters should be used.
15. When suctioning is completed, clear the catheter and tubing of mucous and debris with sterile water or saline.
16. Discard the catheter, water container, and gloves appropriately.
17. Wash hands.
18. The tubing and suction canister should be changed every 24 hours. The canister should be labelled with the date and time when they are changed. If debris adheres to the side of the tubing or the canister, either or both should be changed. The tubing should be secured between suctioning periods so that it will not fall to the bed, floor, etc.

***b. Clean suctioning technique for tracheostomies and tracheal stomas***

Follow the above guidelines with the exception that examination gloves are used instead of sterile gloves. Hands must be washed with soap and water or with an alcohol immediately before and after suctioning the patient.

Place ventilator connection / Ambu mouth piece in a sterile glove

**Do not:**

- ✗ Place the ventilator connection/Ambu bag mouth piece touching the bed/sheet/gown.
- ✗ Reuse the contaminated catheters
- ✗ Wash the ventilator connections / T-piece in water or spirit and reuse.

***c. Self-suctioning***

Patients are taught clean suctioning techniques following the above guidelines. The importance of careful handwashing and correct catheter care, must be emphasised.

### **6.3 URINARY CATHETER**

The urinary tract is a common site of nosocomial infection. Most of these infections follow instrumentation of the urinary tract, mainly urinary catheterization. Proper technique of inserting and maintaining an indwelling catheter will reduce the chance of nosocomial infection.

Catheter associated infection is caused by a variety of pathogens, including *E.coli*, *Klebsiella*, *Proteus*, and *Pseudomonas*. Many of the microorganisms are part of the patient's endogenous bowel flora, but they can also be acquired by cross-contamination from other patients or hospital personnel or by non-sterile techniques.

#### **Urethral catheterization**

##### ***Personnel***

Only persons who know the correct technique of aseptic insertion and maintenance of catheters should handle catheters.

##### ***Catheter Use***

Urinary catheters should be inserted only when necessary and left in place only as long as medically necessary. They should not be used solely for the convenience of patient-care personnel. For selected patients, other methods of urinary drainage such as condom catheter drainage, suprapubic catheterization, intermittent urethral catheterization, and adult disposable diaper pads can be useful alternatives to indwelling urethral catheterization.

##### ***Handwashing***

Handwashing should be done immediately before and after any manipulation of the catheter site or apparatus.

##### ***Catheter Insertion***

Catheters should be inserted using aseptic technique and sterile equipment.

Use an appropriate antiseptic solution for periurethral cleaning.

As small a catheter as possible, consistent with good drainage, should be used to minimize urethral trauma.

Indwelling catheters should be properly secured after insertion to prevent movement and urethral traction.

##### ***Anchoring the catheter***

Strapping of the catheter is done to the lower anterior abdominal wall in male patients. This is to prevent direct transmission of the weight of the bag on the catheter, so that pulling and inadvertent dislodgment of the catheter does not occur. This also helps prevent stricture of the penile urethra if the patient is on a catheter for a long duration.

##### ***Transportation of a patient with a urinary catheter***

1. The urine collecting bag has straps - make sure that these are untied before shifting the patient to avoid inadvertent pulling of the catheter with resultant trauma.



2. During transit, maintain the closed drainage system. Empty urine bag before transport and record volume. The urine bag has a stopper which has to be properly replaced after emptying the bag. See that the urine bag tubing does not get pulled away from the Foley's catheter.
3. Though most of the commercially available urine bags have a non-return valve, maintain the level of the urine bag below the level of the bladder during transit. This is to ensure that no reflux of urine occurs from either the tubing or the bag, back into the bladder.
4. Avoid inadvertent clamping or occluding of catheter or the tubing. See that the urine bag does not get entrapped beneath the patient himself. Ensure that continuous bladder drainage is maintained throughout the transit period.
5. A leg bag is preferred if the patient is to be discharged on continuous bladder drainage with a Foley's catheter for a long time.
6. Check on the patency of the catheter to ensure continuous bladder drainage especially for patients have undergone urinary bladder surgery.
7. Look for position, and ensure a closed drainage system on receiving the patient. Also note the volume and character of urine.

## 6.4 WOUND CARE

### i) Surgical wounds

- Surgical wounds after an elective surgery is inspected on the third post-operative day, or earlier if wound infection is suspected.
- All personnel doing dressings should wash their hands before the procedure.
- Ideally, a two member technique is followed. One to open the wound, and one to do the dressing.
- If two health care workers are not available, then, take off the dressing, wash hands again before applying a new dressing.
- A clean, dry wound may be left open without any dressing after inspection.
- If there is any evidence of wound infection, or purulent discharge, then dressings are done daily, using povidone iodine to clean the wound and applying dry absorbent dressings.
- Disposable plastic aprons must be worn while changing the dressing.

### ii) Care of ulcers

- Dressings of ulcers, of whatever cause should be done at least daily, or more often, depending on the amount of discharge from the ulcer.
- Disposable plastic aprons must be worn while changing the dressing.
- The same technique for surgical wound dressing is used.
- After inspecting the dressing, all the devitalised tissue should be removed, using a scalpel or scissors if necessary.
- The wound should be cleaned with povidone iodine. Other solutions that can be used include hydrogen peroxide and Dakins solution.
- After debridement of the wound a sterile absorbent dressing is applied. Dressings soaked in Dakins solution may also be applied if there is necrotic tissue in the ulcer.

**iii) Care of open surgical wounds, fistulae**

Open surgical wounds and fistulae, discharge a lot fluid. Using a 'wound manager' or stomahesive wafer with ostomy bags helps to keep the wound dry.

A 'wound manager' is useful as it facilitates regular inspection of the wound and debridement if necessary. It also helps if continuous irrigation of the wound with antiseptic solutions or normal saline is required.

The skin around intestinal fistulae should be inspected daily for excoriation. If excoriation is present, either zinc oxide paste or aluminium paste is applied around the skin. Commercially available products include stomahesive wafers, paste and duoderm.

**6.5 TRANSPORTATION OF PATIENTS WITH DRAINAGE OR SHUNTS**

PROCEDURE	RATIONALE
<b>1. Drainage</b> Maintain a closed sterile drainage system during transportation. <ol style="list-style-type: none"> <li>Make sure that the drainage bag is closed with the attached cork / spiget.</li> <li>Avoid disconnection while transporting.</li> <li>Do not raise the drainage bag / bottle above the level of the body cavity from which drainage is connected.</li> <li>Do not clamp the drainage tubes or catheter or do anything to disrupt the drainage system.</li> <li>Use portable stands / holders for drainage bottle / bags while transporting.</li> <li>Have a clamp available while transporting a patient with intercostal.</li> </ol>	Closed sterile drainage system reduces the entrance of organisms  Drainage apparatus must be kept at a lower level than the body cavity to prevent back flow of fluid into the pleural space / body cavity that may cause infection.  If clamped for a long time, pressure may build up and produce tension pneumothrax.  In the event of breakage of bottle to prevent air entry drainage
<b>2. Shunts</b> Make sure that the shunt is covered with sterile dressing during transportation.	To prevent infection.



## 7. ISOLATION POLICIES AND PROCEDURES

Isolation procedures are designed to prevent spread of infectious agents in the hospital.

### 7.1 TRANSMISSION OF INFECTIONS

There are four primary modes of transmission of infectious diseases in the hospital, in addition to blood and body fluids (see Universal Precautions). They are:

- \* **A. Direct Contact** - direct transmission of an infectious agent from an infected person to a susceptible person by physical contact. Example: a person with a draining staphylococcal skin infection can transmit the infection to another person by direct contact.
- \* **B. Droplet Contact** - direct transmission of an infectious agent in a spray of droplets projected by coughing, sneezing, etc. from an infected person at close range (within 3-6 feet) to the mucous membranes of the eyes, nose, or mouth of a susceptible person. Example: a person close to a person with upper respiratory infection can acquire infection when the infected person sneezes.
- \* **C. Indirect Contact** - indirect transmission of an infectious agent from an infected person to a susceptible person via intermediate objects, such as surgical instruments, the surface of patient-care equipment items, or the hands of health care workers. **Indirect contact transmission via contaminated hands of health care workers is the most common mode of transmission of nosocomial infections.** Example: a health care worker who changes a wound dressing or places a nasal oxygen canula on a patient and then rubs his/her eye or touches another patient can transmit infection to himself/herself or the other patient.
- \* **D. Airborne** - transmission of an infectious agent which originated from an infected person or an environmental source and became suspended in the air on dust particles or dried residua of droplets called droplet nuclei. Airborne transmission can occur over longer distance than can droplet contact transmission. Example: measles can be acquired by breathing the air of an empty room which has just been vacated by an infected person.

### 7.2. ISOLATION CATEGORIES

**The appropriate isolation precautions should be initiated once an infectious disease is suspected. This decision may be reviewed after confirming the diagnosis.**

The basic purpose of isolation of a patient is to confine the infectious agent to a restricted area until its danger of spread has been controlled. The following categories are recommended, taking into consideration the route of infection and the infectivity of the organism. Cards on different isolation categories are available and should be used in each ward.



### **A. Strict isolation category**

Infections that are highly contagious or of a severe nature are classified in this category. It is designed to control all primary modes of transmission. Strict Isolation is the most restrictive method of isolating a patient.

#### ***Components of strict isolation:***

1. A single room with a closed door is necessary. Patients are to be directly admitted to the isolation ward, as far as possible.
2. Only authorised personnel should enter the room.
3. Masks and gowns are to be worn by all persons entering the room.
4. Gloves are indicated when handling the patient.
5. Hands must be washed thoroughly after leaving the room, irrespective of whether or not the patient was handled. (Refer 'Handwashing' in the chapter "Techniques")
6. Articles contaminated with infective material must be discarded or bagged and labeled before being sent for decontamination and reprocessing.

### **B. Respiratory Isolation Category (Contact isolation with mask)**

Infectious diseases involving the respiratory tract, with transmission via droplet contact, come in this category. The spread of infection is either through droplets resulting from cough or sneeze, or by indirect contact with respiratory secretions either by hand or by fomites. The environment around the patient is likely to be contaminated by respiratory pathogens. In some diseases the route of infection is via the respiratory tract but the disease manifestations may be in the CNS, skin or other organs.

#### ***Components of respiratory isolation:***

1. Separate room is necessary for certain infections eg. RSV, mumps etc. to prevent airborne transmission and transmission by droplets. Patients with same illness can be cohorted in one room.
2. Masks should be worn by those who come close to the patient.
3. Gowns are not routinely necessary. Use gowns if soiling is likely.
4. Gloves are necessary while handling patients.
5. Hands must be washed after touching the patient or potentially contaminated articles and before taking care of another patient. (Refer 'Handwashing' in the chapter "Techniques")
6. Articles contaminated with infective material must be discarded or bagged and labeled before being sent for decontamination and reprocessing.

### **C. Contact Isolation Category**

These precautions are recommended for infections spreading by direct contact only and also for those with faeco-oral transmission.

#### ***Components:***

1. Gowns are indicated if soiling is likely.
2. Gloves are indicated for touching infected material / area.
3. Hands must be washed after touching the patient or potentially contaminated articles



and before taking care of another patient. (Refer 'Handwashing' in the chapter "Techniques")

4. Articles contaminated with infective material must be discarded or bagged and labeled before being sent for decontamination and reprocessing.

#### **D. Reverse Isolation Category**

The purpose of the reverse isolation category is to prevent infection in the immune compromised patient. The principle is to prevent contact between pathogenic microorganisms from HCWs or fomites and susceptible patients who have severely impaired resistance. These may be used in specialised units such as bone marrow transplant unit & renal transplant unit.

#### **Isolation Policy for special groups of organisms**

##### **1. Methicillin Resistant *Staphylococcus aureus* (MRSA)**

The Microbiology dept shall send an alert to the head of the concerned unit and the Hospital Infection Control Officer when MRSA is isolated.

- ▶ Use respiratory (contact with mask) precautions.
- ▶ Accomodate these patients away from those with open wounds or immunocompromised.
- ▶ Handwashing is the single most important factor in controlling MRSA.
- ▶ Linen - Sheets, pillow cases, and blankets should be changed on a daily basis and more often if soiling occurs. Linen should not be shaken in order to prevent dissemination of micro-organisms into the environment. Linen should be soaked in 7% lysol for 1 hour before being sent to the laundry. The same will apply to masks, gowns and gloves used.

##### **2. Pulmonary tuberculosis:**

- ▶ Respiratory precautions should be taken for smear positive tuberculosis.
- ▶ A separate room is recommended only for adult patients with sputum positive pulmonary tuberculosis.

##### **3. Anthrax:**

Refer to the table on page 41 and to page 81.

*For other organisms, please refer to the table of isolation guidelines that follows.*

#### **7.3 VISITORS POLICY**

Although instructing and preparing visitors for patients in isolation is time consuming and often frustrating, their presence is valuable to the emotional well being of the patient.

- The ward sisters and the doctors concerned shall have the responsibility of informing the patients relatives of the measures to be taken and the importance of restriction of visitors. This should be done at admission of the patient.

- The patient and the relatives must be given health education about the cause, spread and prevention of the infection, in detail. The need for isolation and restriction of visitors should be discussed with them.
- Hand washing after all contact with the patient will have to be stressed.
- No more than two adult visitors should be allowed at a time during the hospital visiting hours and the length of stay should be governed by the needs of the patient.
- Children below 12 years are not allowed into the isolation areas. The policy of our hospital is to allow one female attendant to stay in the ward with the patient. The attendants are individually trained to avoid infection.
- Before entering the room, visitors must enquire at the nurses' station for instructions and for gown and mask if indicated. Visitor's footwear, bags etc., should be left outside the room. Only articles that can be discarded, disinfected or sterilised should be taken into the room.
- Visitors are not allowed to sit on the patient's bed.
- Visitors should wash their hands well with soap and water before entering and when leaving the room.
- Active immunisation of attendants, and other follow up steps, where applicable must be conducted by the physician in-charge.



## 7.4 TABLE OF ISOLATION GUIDELINES

(Adapted from Infection Control Manual of The Johns Hopkins Hospital)

The following tables list isolation/precautions guidelines for most of the infectious diseases likely to be encountered in CMCH Hospital. Diseases are listed alphabetically.

Policies for antibiotic resistant organisms are listed separately at the end of this chapter.

### Guidelines for Isolation/Precautions

DISEASE	TYPE OF PRECAUTION	INFECTIVE MATERIAL	DURATION OF PRECAUTION	COMMENTS
Acquired immunodeficiency syndrome (AIDS; HIV infection)	Universal precautions (and those for concurrent infections)			See Section on Universal Precautions
Actinomycosis	None			
Amoebic liver abscess	None			
Meningo-encephalitis	None			
Anthrax				
Cutaneous or meningitis	Contact	Drainage from lesions	Duration of illness	Notify Infection Control when diagnosis is suspected or confirmed
Pneumonia	Respiratory			
Arbovirus encephalitis	None			
Ascariasis (roundworms)	None			
Aspergillosis	None			
Babesiosis	None			
Botulism (infant; other)	None			
Brucellosis (draining lesions)	Contact	Drainage from lesions	While purulent drainage is present	

DISEASE	TYPE OF PRECAUTION	INFECTIVE MATERIAL	DURATION OF PRECAUTION	COMMENTS
Bum wound infection				
<i>S. aureus</i> , extensive burns	Strict	Drainage from burn wounds	Duration of infection	Gloves and masks are required for dressing changes of extensive burns, even if not infected
Other organisms	Respiratory	Drainage from burn wounds	Duration of infection	
Cat-scratch disease	None			
Chancroid	Contact			
Chickenpox (Varicella)	Strict	Drainage from lesions; respiratory secretions	Until all lesions are crusted	Susceptible persons should stay out of room if possible
Chlamydia infection				
<i>C. pneumoniae</i> pneumonia (TWAR)	None			
<i>C. psittaci</i> pneumonia (Psittacosis)	None			
<i>C. trachomatis</i> conjunctivitis	Contact	Eye secretions	Duration of illness	
<i>C. trachomatis</i> infection, genital	None			
<i>C. trachomatis</i> pneumonia	None			
Cholera	Contact	Faeces	Duration of illness	



DISEASE	TYPE OF PRECAUTION	INFECTIVE MATERIAL	DURATION OF PRECAUTION	COMMENTS
Coccidioidomycosis	None			Label microbiology specimens "Coccidioidomycosis"
Conjunctivitis, viral and bacterial	Contact	Eye secretions	Duration of illness	
Coronavirus infection, respiratory, in infants and children	Respiratory	Respiratory secretions	Duration of illness	
Coxsackie virus infection				
(A) Respiratory				
(i) Adults	Respiratory	Respiratory secretions and faeces	For 7 days after onset of symptoms	
(ii) Infants and children	Respiratory	Respiratory secretions and faeces	Duration of hospitalization or 5 weeks, whichever comes first	
(B) Other				
(i) Adults	Contact	Faeces	For 7 days after onset of symptoms	
(ii) Infants and children	Contact	Faeces	Duration of hospitalizaion or 5 weeks, whichever comes first	
Creutzfeldt-Jakob disease	Contact	CNS tissues, CSF; possibly other tissues, blood and urine	Duration of hospitalization	

DISEASE	TYPE OF PRECAUTION	INFECTIVE MATERIAL	DURATION OF PRECAUTION	COMMENTS
Croup	Respiratory	Respiratory secretions	Duration of illness	
Cryptococcosis	None			
Cryptosporidiosis	Contact	Faeces	AIDS patients - duration of hospitalization; other patients - duration of illness	
Cysticercosis	None			
Cytomegalovirus infection	None			
Decubitus ulcer infection	Contact	Purulent drainage from lesions	While purulent drainage is present	
Dengue fever	None			
Diarrhoea, infectious (suspected or confirmed)	Contact	Faeces		
Diphtheria				
Cutaneous	Respiratory	Drainage from lesions	Until 2 cultures from both nose and throat and from skin lesions taken at least 24 hours apart after cessation of antimicrobial therapy are negative for <i>C.diphtheriae</i>	Notify Infection Control when diagnosis is suspected or confirmed
Pharyngeal	Strict	Respiratory secretions		
Dysentery	Contact	Faeces		
Ebola hemorrhagic fever	Strict	Blood; most secretions	Duration of hospitalization	Notify Infection Control when diagnosis is suspected or confirmed



DISEASE	TYPE OF PRECAUTION	INFECTIVE MATERIAL	DURATION OF PRECAUTION	COMMENTS
Echinococcosis	None			
Echovirus infection				
(i) Respiratory	Respiratory	Respiratory secretions and faeces	Duration of hospitalization or 5 weeks, whichever comes first	
(ii) Other infection	Contact	Faeces		
Epiglottitis	Respiratory	Respiratory secretions	For 24 hours after start of effective therapy	
Epstein-Barr virus Infection (Infectious mononucleosis)	None			
Erysipelas	Contact	Drainage from lesions	For 24 hours after start of effective therapy	
<i>Erysipelothrix rhusiopathiae</i> infection (erysipeloid)	None			
Gas Gangrene	Contact	Purulent drainage	While purulent drainage is present	
Gastroenteritis (suspected or confirmed)	Contact	Faeces		
Gonorrhoea				
Ophthalmia Neonatorum	Contact	Purulent eye drainage	For 24 hours after start of effective therapy	
Other	None			
Granuloma inguinale (donovanosis, granuloma venereum)	None			

DISEASE	TYPE OF PRECAUTION	INFECTIVE MATERIAL	DURATION OF PRECAUTION	COMMENTS
<i>Haemophilus influenzae</i> infection				
Epiglottitis	Respiratory	Respiratory secretions	For 24 hours after start of effective therapy	Notify Infection Control when diagnosis is suspected or confirmed
Meningitis	Respiratory	Respiratory secretions		
Pneumonia infants and children (any age)	Respiratory	Respiratory secretions		
Hand, foot and mouth disease				
Adults	Respiratory	Respiratory secretions and faeces	For 7 days after onset of symptoms	
Infants and children	Respiratory	Respiratory secretions and faeces	Duration of hospitalization or 5 weeks, which ever comes first	
Haemolytic-uremic syndrome	Contact	Faeces	Until 3 successive stool cultures are negative for E. Coli 0157:H7 or Shigella	
Hepatitis, viral				
(i) Type A & E	Contact	Faeces	Until liver enzymes begin to decrease	See Section on Universal Precautions
(ii) Hepatitis other than A&E	Universal precautions			
Herpangina (vesicular pharyngitis)				
Adults	Respiratory	Faeces and respiratory secretions	For 7 days after onset	
Infants and children	Respiratory	Faeces and respiratory secretions	Duration of hospitalization or 5 weeks	



DISEASE	TYPE OF PRECAUTION	INFECTIVE MATERIAL	DURATION OF PRECAUTION	COMMENTS
Herpes simplex infection				
Encephalitis	None			
Mucocutaneous, disseminated or localized	Contact	Drainage from lesions	Until all lesions are crusted	
Neonatal (including newborns with perinatal exposure)	Contact	All secretions	Duration of hospitalization	
Visceral, disseminated	Contact	Respiratory and oral secretions	Duration of illness	
Human Herpes Virus 6 infection	Respiratory	Respiratory secretions	Duration of illness	
Herpes virus simiae	Strict	Drainage from wounds and lesions; saliva, stool, and urine	Duration of hospitalization	
Herpes Zoster infection				
Localized with lesion that can be covered	Contact	Drainage from lesions	Until lesions are crusted	Privated room not required. Roommates must be immune. Patients may leave room only if lesions are covered. No playroom visits
Localized with lesions that cannot be covered disseminated	Strict	Drainage from lesions	Until lesions are crusted	Susceptible persons should stay out of the room if possible

DISEASE	TYPE OF PRECAUTION	INFECTIVE MATERIAL	DURATION OF PRECAUTION	COMMENTS
Histoplasmosis	None			
Hookworm disease	None			
Impetigo	Contact	Drainage from lesions	For 24 hours after start of effective therapy	
Lassa fever	Strict	Blood, body fluids and respiratory secretions	Duration of illness	Notify Infection Control when diagnosis is suspected or confirmed
Legionellosis (Legionnaires disease)	None			
Leprosy (Hansen's disease)	None			
Leptospirosis	Contact	Urine, blood, body fluids	Duration of hospitalization	
Lice	None			
Listeriosis	None			
Lyme disease	None			
Lymphocytic choriomeningitis	None			
Lymphogranuloma venereum	None			
Malaria	None			
Measles (rubeola)				
Immunocompromised patients	Strict	Respiratory secretions	Duration of illness	Notify Infection Control when diagnosis is suspected or confirmed
Other patients	Strict	Respiratory secretions	Until 4 days after onset of rash	

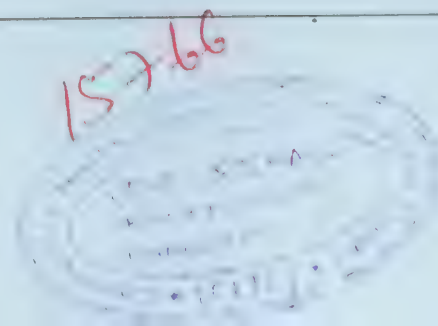


DISEASE	TYPE OF PRECAUTION	INFECTIVE MATERIAL	DURATION OF PRECAUTION	COMMENTS
Melioidosis ( <i>Burkholderia pseudomallei</i> )	None			
Meningitis				
(i) Aseptic				
Enterovirus	Contact	Faeces	Duration of hospitalization or 5 weeks, whichever comes first	
Other	None			
(ii) Bacterial				
<i>Haemophilus influenzae</i>	Respiratory	Respiratory secretions	For 24 hours after start of effective therapy	Notify Infection Control when diagnosis is suspected or confirmed
<i>Neisseria meningitidis</i>	Respiratory	Respiratory secretions	For 24 hours after start of effective therapy	
(iii) Others	None			
Meningococemia (Meningococcal sepsis)	Respiratory	Respiratory secretions	For 24 hours after start of effective therapy	Notify Infection Control when diagnosis is confirmed or suspected
Molluscum contagiosum	None			
Mucormycosis	None			
Mumps (infectious parotitis)	Respiratory	Respiratory secretions	For 9 days after onset of swelling	Notify Infection Control when diagnosis is suspected or confirmed Roommates must be immune. No visits to playroom

DISEASE	TYPE OF PRECAUTION	INFECTIVE MATERIAL	DURATION OF PRECAUTION	COMMENTS
Mycobacteria other than tuberculosis infections (MOTT; atypical mycobacteria)	None			
Necrotizing enterocolitis (NEC)	Contact	Faeces	Duration of illness	
Nocardiosis	None			
Parvovirus B 19 infection				
(i) Rash illness (fifth disease; erythema infectiosum)	None			
(ii) Transient aplastic crisis in patients with underlying hemoglobinopathies	Respiratory	Respiratory secretions	Duration of illness	
(iii) B19 viremia in patients with AIDS, hematologic malignancies, or organ transplant-related immuno suppression	Respiratory	Respiratory secretions	Duration of illness	
Pediculosis (lice)	None			
Pertussis (whooping cough)	Strict	Respiratory secretions	For 7 days after start of effective therapy. If no therapy is given, isolate for 3 weeks after onset of cough	Notify Infection Control when diagnosis is suspected or confirmed  Private room is required
Pinworm infection	None			



DISEASE	TYPE OF PRECAUTION	INFECTIVE MATERIAL	DURATION OF PRECAUTION	COMMENTS
Plague				
Bubonic	Contact	Drainage from lesions	For 3 days after start of effective therapy	Notify Infection Control when diagnosis is suspected or confirmed
Pneumonic	Strict	Respiratory secretions	For 3 days after start of effective therapy	
Pleurodynia				
Adults	Contact	Faeces	For 7 days after onset of symptoms	
Infants and children	Contact	Faeces	For duration of hospitalization or 5 weeks, whichever comes first	
Pneumonia (Viral - includes influenza, parainfluenza)	Respiratory	Respiratory secretions	For duration of illness	
Poliomyelitis, acute	Contact	Faeces	Duration of hospitalization or 5 weeks	Notify Infection Control when diagnosis is suspected or confirmed
Pseudomembranous colitis	Contact	Faeces	Until diarrhoea stops	A private room is recommended for patients who are toxin positive and have diarrhoea or are incontinent. Patients who are toxin positive but without diarrhea or incontinence do not need isolation



DISEASE	TYPE OF PRECAUTION	INFECTIVE MATERIAL	DURATION OF PRECAUTION	COMMENTS
Q fever	None			
Rabies	Strict	CSF, saliva, tears, urine & body tissues	Duration of illness	Notify Infection Control when diagnosis is suspected or confirmed. Private room is required
Rat-bite fever ( <i>Streptobacillus moniliformis</i> or <i>Spirillum minus</i> infection)	None			
Rheumatic fever	None			
Rickettsial fever (Rocky Mountain spotted fever, tickborne typhus)	None			
Ringworm (dermatophytosis, dermatomycosis, tinea)	None			
Roseola infantum (exanthem subitum)	Respiratory	Respiratory secretions	Duration of illness	
Rubella (German measles)				
Primary infection	Strict	Respiratory secretions	For 7 days after onset of rash	Notify Infection Control when diagnosis is suspected or confirmed
Congenital infection	Strict	Respiratory secretions and urine	During any admission for the 1st year after birth unless nasopharyngeal, and urine cultures after 3 months of age are negative for rubella virus	Notify Infection Control when diagnosis is suspected or confirmed



DISEASE	TYPE OF PRECAUTION	INFECTIVE MATERIAL	DURATION OF PRECAUTION	COMMENTS
Scabies	Contact	Infested area	Until treated	
Schistosomiasis	None			
Small Pox	Strict			Eradicated
<i>Staphylococcus aureus</i> infection				
Furunculosis	Contact	Drainage from lesions	Until lesions are resolving and drainage stops	
Wound or skin infections (with pus)				
Major (extensive)	Respiratory/Strict	Pus	While purulent	
Minor (contained by dressing)	Contact	Pus	While purulent	
Enterocolitis	None			
Scalded skin syndrome	Contact	Drainage from lesions	Duration of illness	
Toxic shock syndrome	None			
Streptococcal infection, group A				
Skin, wound or burn infection	Contact	Pus or drainage from lesions	For 24 hours after start of effective therapy	
Pharyngitis	Respiratory	Respiratory secretions		
Scarlet fever	Respiratory	Respiratory secretions		
Streptococcal infection, group B ( <i>Streptococcus agalactiae</i> )	None			

DISEASE	TYPE OF PRECAUTION	INFECTIVE MATERIAL	DURATION OF PRECAUTION	COMMENTS
Strongyloidiasis	None			
Syphilis				
Congenital, primary, and secondary	Contact	Drainage from lesions; blood	For 24 hours after start of effective therapy	
Latent and tertiary	None			
Tapeworm infections, all types	None			
Tetanus	None			
Tinea (dermatomycosis, dermatophytosis, ringworm)	None			
Toxoplasmosis	None			
Trachoma, acute ( <i>Chlamydia trachomatis</i> )	Contact	Purulent exudate	Duration of illness	
Trichinosis	None			
Trichuriasis (whipworm disease)	None			
Tuberculosis				
A - Extrapulmonary				
(i) Laryngeal, oral, upper airway	Respiratory	Respiratory secretions	Until lesions have resolved and, if pulmonary TB is present, until the criteria for discontinuing respiratory isolation for pulmonary TB have been met	Notify Infection Control when diagnosis is confirmed or suspected
(ii) Other	None			



DISEASE	TYPE OF PRECAUTION	INFECTIVE MATERIAL	DURATION OF PRECAUTION	COMMENTS
B - Pulmonary (suspected or confirmed)	Respiratory/ Strict	Respiratory secretions		Smear positive adult - isolate Children with pulmonary tuberculosis (TB) are rarely infectious. Children thought to have transmissible (e.g. cavity of AFB smear-positive) pulmonary TB should be isolated similarly to adults and adolescents
Tularemia				
Draining lesion	Contact	Drainage from lesions	Duration of illness	
Pulmonary	None			
Typhoid fever	Contact	Faeces	Duration of illness	
Typhus, (endemic and epidemic)	None			
Ulcer/Wound Infection	Contact	Drainage from lesions		
Vaccinia				
At vaccination site	Contact	Drainage from lesions	Duration of illness	
Generalized and progressive, eczema vaccinatum	Respiratory	Drainage from lesions	Duration of illness	Notify Infection Control when diagnosis is suspected or confirmed
Zygomycosis (phycomycosis, mucormycosis)	None			

## 7.5 ISOLATION PRECAUTIONS FOR SELECTED ANTIBIOTIC-RESISTANT ORGANISMS

Infection control of bacterial pathogens resistant to multiple antibiotics is problematic. Once such bacteria are established in the community and occur in the hospital, eradication may become impossible and containment of spread may be difficult. Barrier precautions have traditionally been used to limit spread, but without clearly documented efficacy. However, such measures have been shown to be effective in terminating outbreaks involving resistant organisms.

The following approach has been adopted in the Hospital to focus on areas that are

- (a) most likely to be involved in the spread of resistant organisms
- (b) most likely to incur morbidity as a result of acquisition of resistant organisms. In addition, measures for attempting to eradicate non-endemic resistant organisms are specified.

### A. Endemic resistant bacteria

For resistant bacteria which have become endemic in the Hospital and in the populations from which patients originate, efforts are based on the goal of containing spread rather than attempting to eradicate the bacteria from the Hospital. Patients from whom such bacteria are isolated are placed on strict isolation only if they are housed in an Intensive Care Unit or are in the Children's Centre. A current example is methicillin resistant *S. aureus* (MRSA) and imipenem resistant *Acinetobacter*.

### B. Nonendemic resistant bacteria

For resistant bacteria which have not become endemic in the Hospital, efforts are based on the goal of eradicating the bacteria from the Hospital. All patients from whom such bacteria are recovered are placed on strict isolation precautions. Cohort nursing and patient placement techniques are used. A current example is methicillin resistant *Staphylococcus aureus*. Organisms in this category may be reclassified to category (A) above if it becomes clear that they have become endemic in the Hospital and in patient source populations.

*The table given in the following page summarises the isolation precautions for selected antibiotic resistant organisms.*



### Precautions guidelines for selected antibiotic-resistant organisms

DISEASE	TYPE OF PRECAUTION	INFECTIVE MATERIAL	IDEAL OF PRECAUTIONS ★
Acinetobacter (imipenem resistant)	Strict in ICUs Contact in other areas		
Enterococci resistant to vancomycin (colonisation or infection)	Strict	Body substances containing the organism	Until all culture positive sites become negative and 3 successive stool cultures are negative for the organism
Gram-negative organisms resistant to all tested antibiotics (colonisation or infection)	Contact	Body substances containing the organism	Until all culture positive sites become negative and 3 successive stool cultures are negative for the organism
Pneumococci resistant to penicillin (colonisation or infection)	Respiratory	Respiratory secretions	Until all culture positive sites become negative and a throat culture is negative for the organism
Pseudomonas (Multidrug resistant)	Contact		
<i>S. aureus</i> , methicillin resistant (MRSA)	Strict in ICUs Contact in other areas	Drainage from lesions and other body substances containing the organism	Until all culture positive sites become negative and a nares culture is negative for the organism

★ However, this may not always be practical in our situation. In such cases, it is better to follow the isolation precaution during the total duration of hospitalisation.



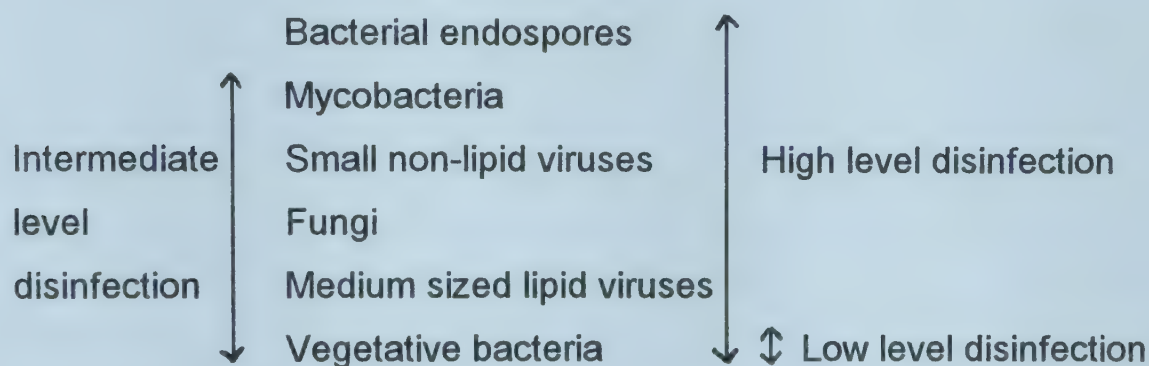


## 8. DISINFECTION AND STERILIZATION

### 8.1 DISINFECTION

Sterilization is defined as a process where all microbes are removed from a defined object, inclusive of bacterial endospores. Disinfection is a process where most microbes are removed from a defined object or surface, except bacterial endospores. Certain chemicals are capable of sterilizing an object if exposed for long periods of time, and serve as disinfectants at shorter exposure time. However, a common practice is to call all chemical agents as "disinfectants", this being a misnomer.

Disinfectants can be classified according to their ability to destroy these categories of microorganisms (refer to the diagram below). The agent which destroys only vegetative bacteria is termed low level disinfectant. If the agent is capable of rendering mycobacteria non-viable, it is termed an intermediate level disinfectant. It is a safe assumption that all the other categories of microbes which are classified more susceptible e.g. fungi, are also destroyed if efficacy against mycobacteria can be demonstrated. High level disinfection is in other words sterilization wherein all microbial life is destroyed, inclusive of endospores.



When an external material is introduced into a sterile or clean environment of the body, it has to be rendered free of microbes. However, a distinction has to be made as to what procedure is to be undertaken (high, intermediate or low level disinfection) for access to various parts of the body in order to simplify the day to day running of patient care areas, as well as to minimise unnecessary expenditure, optimize care, and reduce the level of nosocomial infections. It is also necessary to rid articles of microbes after using them, in order that they may be rendered safe for handling by personnel cleaning, transporting, packing and sterilizing them. The table given on the next page helps in understanding the essentials of this topic.

Several methods of disinfection are available, but standardization and uniformity throughout a hospital is essential. It is also necessary that all disinfectants should undergo testing in the laboratory against common hospital pathogens. The testing should be done regularly "in use" as well as periodically under standard test conditions. This must be done in order to detect emerging resistance, which is a real possibility in our situation. This will be done at the initiative of the HICC in conjunction with the microbiology department. It is also mandatory that any new disinfectant or new brand of disinfectant must undergo "capacity testing" before inducted into use for the patient care areas.



**High level disinfection:**

Ethylene oxide and glutaraldehyde (at a specific length of exposure time) can be called high level disinfectants / chemical sterilants. Certain chemicals display some degree of sporicidal action and can overlap in the spectrum of high level disinfectants though in reality they limit themselves to the intermediate range predominantly (eg. povidone iodine) .

**Intermediate level disinfection:**

Intermediate level disinfection is effected by a large group of chemicals, and this is the major group of chemicals that are being used in the hospital setting. These include alcohols (ethyl alcohol and isopropyl alcohol); halogens-chlorine compounds (hypochlorite, bleach) and iodine compounds (iodine and povidone iodine); hydrogen peroxide; chlorhexidine; phenols (lysol, caolol, phenol); aldehydes (formaldehyde, glutaraldehyde-limited exposure time) etc. Of all these, certain compounds are chosen for use in specific situations depending on various factors including time of action, toxicity, corrosiveness, shelf life etc.

Universally, the disinfectant of choice that can be safely used on inanimate objects is 7% lysol. Other chemicals can be used on special advice from the HICC.

**Low level disinfection:**

This comprises of benalkonium chloride (a quarternary ammonium salt), certain soaps etc.

<b>Equipments / Instruments</b>	<b>Method before use</b>	<b>Method after use</b>
Penetrating skin/mucous membrane (critical)	High level disinfection or sterilization	Intermediate level disinfection
Contact with intact mucous membrane without penetration (semi-critical)	High level disinfection	Intermediate level disinfection
Contact with intact skin, no contact with mucous membrane (non-critical)	Intermediate level or low level disinfection	Intermediate level or low level disinfection

**Disinfection of ward items:**

The disinfection procedure for the various items used in the wards is as mentioned below:

Stethoscope & BP cuff	→ Wipe with spirit
Furniture, equipment & fittings	→ Refer to the section on housekeeping
Floor and walls	→ Refer to the section on housekeeping
Toilets	→ Refer to the section on housekeeping
Linen	→ Refer to the section on housekeeping & laundry



- |             |  |
|-------------|--|
| Thermometer | → To be wiped with cotton and immersed in the thermometer solution for 3-5 minutes after use. It is then to be wiped dry with a clean cotton and kept dry or left immersed in alcohol. |
| Endoscopes  | → Refer to the section on endoscopes, later in this chapter.   |

### Disinfectants used in CMCH:

1. **2% glutaraldehyde:** This is marketed by various companies:
  - Rapid acting - can be used upto 14 days after activating
  - Long acting - can be used upto 28 days after activating
  - Contact time for disinfection: 15-30 minutes; for sterilisation – 8-10 hours
2. **Dakins solution:** It is a 1% solution of sodium hypochlorite; the active ingredient being nascent oxygen. Only a freshly prepared solution will be active. If not available, household bleach can be used for this purpose (calcium hypochlorite).
3. **Lysol 7% :** Lysol is a highly corrosive fluid, especially to the eyes. No concentrated solution should be kept in the wards or departments. When using, ensure that splashing does not occur. Wash hands thoroughly after use.
4. **Boiling :** Where it is necessary to boil, the article being boiled must be completely immersed in the water and hollow tubes filled with the water. Rubber goods should be boiled for three minutes and other items should be boiled for 20 minutes.

### Tests for disinfection:

'In use' testing of disinfectants in various wards is performed once a month in which a sample of the disinfectant in use is cultured to identify growth of organisms.

### Endoscopes - Cleaning and disinfection:

Every patient undergoing endoscopy should be examined with clean disinfected equipment. In order to ensure a uniform standard of safety for each patient, the cleaning and disinfection procedures should be carried out immediately before each individual endoscopic procedure.

#### 1. Mechanical cleaning of endoscope:

The most important step in the prevention of infection during endoscopy is mechanical cleaning. If the endoscope is rigorously cleaned, there is little risk of cross infection from this source. Alcohol and aldehyde compounds must not be used for mechanical cleaning because they denature and coagulate protein. Non-immersible endoscopes should be phased out.

#### 2. Immediate action on removal from patient:

Flush the air/water channel for 10-15 seconds to eject any refluxed blood or mucus. Aspirate detergent through the biopsy/suction channel for about 10-15 seconds to remove gross debris.

### 3. Cleaning:

- ▶ Wash the outside of the instrument thoroughly with disposable sponges or swabs. Brush the distal end with a soft tooth brush.
- ▶ Using a cleaning brush suitable for the instrument and channel size, brush through the suction channel.
- ▶ Flush each internal channel with detergent fluid. This should be done independently for each separate channel.
- ▶ Flush all channels as above using water followed by air to expel as much water as possible prior to disinfection. If the water contains particles, which can lead to blockage, filtered water should be used.

### 4. Disinfection:

The endoscope and all internal channels should be soaked in 2% glutaraldehyde or disinfectant of similar potency for at least 15 min. This period of disinfection will not necessarily destroy all mycobacteria or bacterial spores, but, if rigorous mechanical cleaning has been performed prior to disinfection the likelihood of the instrument containing an infectious inoculum is negligible.

### 5. Rinsing:

Following disinfection, rinse the instrument internally and externally with drinking quality water to remove all traces of disinfectant.

### 6. Drying:

Dry the endoscope externally paying particular attention to the light guide connector and eye piece. Flush air through each channel.

### **Scclerotherapy needles**

- Separate needles are used for patients known to harbour blood borne pathogens.
- All equipments used for procedures during ERCP are sterilized in CSSD.

### **Precautions for fiberoptic rhinopharyngolaryngoscopy as well as rigid Hopkins telescopes.**

The same principles as those for endoscopes apply here also.

## **8.2 STERILIZATION**

Sterilization can be defined as the process by which all microorganisms are removed from a surface or object, inclusive of bacterial endospores. The diagram given at the beginning of this chapter explains the gradation of organism type according to the order of susceptibility to disinfectants. Any process that will destroy the whole range of organisms is termed as sterilization.

Sterilization can be through physical and chemical means. Physical means include heat, and radiation. Chemical sterilizing agents are relatively expensive and are used in specific situations. In our hospital 2% glutaraldehyde (activated), and ethylene oxide are the two chemical sterilizing agents used.

Heat can be employed as dry heat (Hot air oven, flaming, infra red rays) which oxidizes



and denatures proteins and as moist heat (autoclave) which coagulates and denatures proteins. It is to be noted that boiling is not a mode of sterilization but only a mode of disinfection.

Gamma radiation is inappropriate for a small setup and is used in industry for sterilizing articles in bulk e.g. disposable syringes etc.

### **Sterilization by heat**

This is by far the most popular method because of its simplicity, reliability, and is environment friendly in addition to being inexpensive. Autoclaves, hot air ovens and infra red sterilizers are used.

#### **Autoclave**

Autoclaves function under the principle of steam under pressure in order to raise the temperature of steam. This is very effective because of the emission of the latent heat of vapourisation of steam. Various models are in use ranging from gravity displacement models to completely auto cycled high pressure - vacuum models. Various models may vary in their specifications.

CMCH has two types of autoclaves:

- Pre-vacuum autoclave - this is used mainly for syringes and other glassware and has a holding time of 4 minutes at 132°C.
- Gravity displacement autoclave : - this requires a holding time of 30 minutes at 121°C.

Almost any article which is heat stable can be sterilised using the autoclave. Powders, creams, oils and all glass articles cannot be sterilised using this method.

#### **Hot air oven**

Dry heat employed in this method is not as effective as moist heat. Hot air is provided by an electric heating element and is circulated using fans (convection currents) inside the oven. The specific advantage of this is the ability to sterilize powders, oils, creams and all glass articles. General specifications include cycles of 1 hour at a temperature of 160°C. Small models of hot air ovens can be used in separate patient care areas and requires minimal skill to use.

*For indicators for effective sterilisation, refer to the section on CSSD, under the chapter 'Service Units'.*

### **Chemical sterilizing agents**

These include 2% glutaraldehyde and ethylene oxide. They are expensive and are to be used in the sterilization of heat labile substances.

2% glutaraldehyde is an effective sterilizing agent when alkaline (pH 7.4 - 8.9). The articles are to be clean of any bio burden and are to be kept immersed in this solution for at least 6-8 hours for sterilization. 15 - 30 mins will be adequate for disinfection. This is used in disinfecting endoscopes, respiratory tubings etc. Hypersensitivity to glutaraldehyde (local or systemic) may prove to be a problem for handlers.

Ethylene oxide is a toxic gas and a very effective sterilizing agent. Precautions include

scrupulous cleanliness and dryness of the object - otherwise a toxic layer of ethylene glycol forms on the surface. Adequate aeration - atleast 12 hours after cycling is necessary to allow dissipation of free toxic gas. It can be used for all heat sensitive articles.

#### *Requirements for ETO gas sterilisation*

Moisture	:	20 - 40% relative humidity
Concentration	:	540mg/lit- 900mg/lit
Temperature	:	50°C
Cycling & aeration time	:	16 hours

Rubber items, polythene and plastic items, electronic items and cables, instruments used for scopy and parts of operating microscopes are sterilised using ETO gas.

### **8.3 FUMIGATION**

Fumigation is to be carried out by the EMD and the request for the same has to be issued only after obtaining approval from the Medical Superintendent at every instance. It is also mandated that the EMD has to inform the Medical Superintendent when any patient care area is to be fumigated.

#### **Indications**

1. If there is a case of anthrax, gas gangrene, or an open septic wound with laboratory evidence of *C.tetani*, in any area where surgical procedures are carried out, fumigation is mandatory after the procedure.
2. If any new construction or reconstruction of any theatre is done fumigation is mandatory before the functioning of the same.
3. When routine surveillance reveals *C.tetani* or any other pathogenic spore former, fumigation is mandatory.

#### **Details of fumigation of theatre**

1. 1000 C.ft. room space -  
Material needed: a) Formalin - 500 ml.  
b) 10% Ammonia - 300 ml.
2. Keep an electric stove inside the room with switch outside.
3. Seal the room air tight. Use adhesive to close gaps
4. Add 500 ml. formalin to water 1 litre (Total 1½ litres). Keep in a metal vessel on the stove.
5. Close the door air tight.
6. Come out and switch on stove.
7. Leave for 3½ to 4 hours till everything boils and evaporates.



8. Switch off the stove and leave the room sealed for 10 hours or overnight.
9. Enter the room wearing a mask and with ammonia.
10. Pour ammonia in the container.
11. Remove from the stove and come out.
12. Seal the room again.
13. DO NOT SWITCH THE STOVE ON
14. Leave it for 4-8 hours.
15. Open the room wearing a mask. Open all windows and ventilators and aerate well.





## 9. HOSPITAL WASTE : MANAGEMENT

Hospital waste is essentially different from domestic waste in that it contains biological material, which may possess potentially harmful micro-organisms. Therefore, special care should be taken while managing hospital waste to make sure that it does not harm others.

### Major categories of medical waste

- ✱ Non infectious items      Domestic / kitchen waste  
    Paper / wrappers  
    Ampoules, vials and IV bottles
- ✱ Infectious items            Sharps  
    Plastic  
    Non-plastic

Hospital waste management consists of the following steps :

1. Segregation
2. Transport
3. Temporary storage
4. Final disposal

### 1. Segregation:

Segregation should take place at the source of generation of waste. It is important that segregation takes place at the source, as it is the person who generates the waste who best knows its nature. A colour code is followed, which is maintained throughout. All patient care areas have containers lined by polythene covers of the appropriate colour. Waste is segregated as follows:

#### ✱ Non infectious items :

- A **black** plastic bag is used to segregate domestic waste, wrappers of gloves, wrappers of syringes, etc. **No breakable item is to be put into the bag.**
- Other non-infectious items: Empty saline bottles, IV bottles, vials and ampoules (both glass and plastic) are kept separately in cardboard boxes.

#### ✱ Infectious items

- **Sharps**: These are stored in custom-made **puncture proof containers painted in blue** and bearing the 'Biohazard' symbol. There are large sized containers and small sized containers in the various patient care areas. The larger containers are placed in the nurses' station and in treatment rooms. Health care workers take the smaller containers to the bedside to dispose sharps directly into them soon after use. Positioning of sharp containers in strategic areas is necessary especially in areas like emergency services, operation theatre and dialysis unit.
- **Plastic** items: They are segregated in **pink** plastic covers. These items are kept separately as they are not to be incinerated.

- **Infectious non-plastic** items: A **yellow** plastic bag is used to segregation all other infectious waste. Items under this category include dressings, cotton and gauze pieces that have been used on a patient. Human anatomical waste also comes in this category.

## **2. Transportation:**

Waste from the various patient care areas is removed twice a day. The mouth of each plastic bag is tied before removal from wards to prevent spillage of contents of the bags. Designated personnel transport the waste in toto inside the plastic bags on trolleys designated for that purpose. The staff are provided with personal protective equipment.

Waste segregated in the above manner is transported to areas specifically allotted for further management of each category of waste. During transportation, care is taken to ensure that there is no mixing of waste.

## **3. Temporary storage:**

Separate areas within the disposal yard are allocated for temporary storage of each category of waste. Most of the waste generated from the hospital is finally disposed within 6 hours of collection from the wards. No waste is left untreated or untransported for more than 24 hours.

## **4. Final disposal:**

- Non infective wastes (collected in black bags) are disposed in a landfill.
- Infected solid wastes and human anatomical wastes (contents of yellow bags) are incinerated.
- Infected plastics (collected in a pink bag) are disinfected and shred. Plastics cannot be incinerated, as they produce dioxins when burnt, which is known to be carcinogenic.
- Sharps are rendered non-recyclable by mutilating them using heat.



## 10. HOUSEKEEPING

### 10.1 HOUSEKEEPING IN WARDS

A patient admitted to the hospital can develop infection due to bacteria that survive in the environment. Therefore, it is important to clean the environment thoroughly on a regular basis. This will reduce the bacterial load and make the environment unsuitable for growth of micro-organisms.

1. The **floor** is to be cleaned at least 4 times in 24 hours. Detergent and copious amounts of water should be used during one cleaning. Lysol may be used to mop the floor for the remaining times.
2. The **walls** are to be washed with a brush, using detergent and water once a week (usually on Sundays).
3. **High dusting** is to be done with a wet mop, every Sunday.
4. **Fans and lights** are cleaned with soap and water once a month. This is the responsibility of the 'electrical' section.
5. All **work surfaces** are to be disinfected by wiping with 7% lysol and then cleaned with detergent and water twice a day.
6. **Cupboards, shelves, beds, lockers, IV stands, stools and other fixtures** are to be cleaned with detergent and water once a week (on Sundays).
7. **Curtains** are to be changed once a month or whenever soiled. These curtains are to be sent for regular laundering. In certain areas, eg. transplant units and ICUs, more frequent changes are required.
8. Patient's **cot** is to be cleaned every week with detergent and water. In the isolation ward, cleaning is done daily. 7% lysol is to be used when soiled with blood or body fluids.
9. **Store rooms** are to be mopped once a day and high dusted once a week.
10. The floor of **bathrooms** is to be cleaned with a broom and detergent once a day. For disinfection, 7% lysol can be used.
11. **Toilets** are cleaned with a brush using a detergent twice a day (in the morning and evening). Disinfection may be performed using 7% lysol. Hydrochloric acid is to be used once a month to remove stains.
12. **Wash basins** are to be cleaned with vim powder every morning and with hydrochloric acid once a month.
13. Regular **AC maintenance** is required. The AC section should draw up a protocol for this.

#### Patient linen

- Bed linen is to be changed once in 2 days and whenever soiled with blood or body fluids.
- Patients gown is to be changed every day and whenever soiled with blood or body fluids.

- Dry dirty linen is to be sent to the laundry for regular wash.
- Linen soiled with blood or body fluids, and all linen used by patients diagnosed to have HIV, HBV, HCV and MRSA, is to be decontaminated in the ward by soaking in 7% lysol for at least 1 hour and then sent to the laundry.

#### **Rubber goods (Eg. Mackintoshes)**

They are to be cleaned with soap and water, disinfected with 7% lysol, dried in the sun, powdered, rolled and stored.

#### **Thermometer solution**

Separate thermometers are recommended in intensive care units, nurseries and transplant units. In areas where a common thermometer is used, it is disinfected between patients by immersing it in the thermometer solution (containing alcohol) for 5 minutes. After disinfection, the thermometer is washed and kept dry or immersed in alcohol. Empty the water from the container when not in use, and keep it dry. The thermometer solution should be changed once in three days. The date of change of thermometer solution should be written on an adhesive tape, which is stuck to the tray.

#### **Miscellaneous items**

- K basins, basins, bed pans, urinals, etc to be cleaned with vim powder and water and disinfected with 7% lysol.
- Metal buckets are to be cleaned with vim powder every week
- Dustbins are to be cleaned with detergent and water every morning.

### **10.2 HOUSE KEEPING IN THE ISOLATION WARD**

#### **Before admission:**

The admitting physician should inform the sister in charge of Isolation Ward at least one hour prior to admission, mentioning the diagnosis, sex and the general state of the patient.

#### **Pre-requisites for Isolation**

- A source of running water should be available at the entrance of each room to facilitate handwashing.
- The mattress and pillows should have an impervious cover such as mackintosh so that it can easily be damp dusted.
- Clean gowns should always be available.
- Separate urinals, bedpans and thermometers are to be used for each patient.
- A bin lined with the appropriate colour coded plastic cover should be available in each room for disposal of medical waste.
- Rooms should be isolated according to disease conditions and should be well lit.

#### **Cleaning procedure for Isolation room:**

1. Linen should be stripped from the bed with care taken not to shake the linen during this action. Linen should be soaked for 1 hour in 7% lysol and then sent to the laundry.



2. All other articles like I.V stands and furniture should be cleaned with detergent and disinfected with 7% lysol.
3. Walls should be cleaned with detergent and disinfected with 7% lysol.
4. The bathrooms should be cleaned with detergent and disinfected with 7% lysol.

**At discharge (terminal disinfection) :**

- ▶ Keep an ultraviolet light in the room facing each direction for half an hour in a 2 bedded room and for 1 hour in a 4 bedded room.
- ▶ The pillows and mattress are to be cleaned with detergent, disinfected with 7% lysol and dried in sunlight for 24 hours.
- ▶ Bedsheets, curtains, gowns and dusters must be removed, soaked in 7% lysol for one hour and then sent to laundry.
- ▶ After disinfection, wash the room, wall, window, doors, bathroom, sink and furniture with soap solution after doing thorough high dusting in that cubicle.
- ▶ Soak bed pan, urinal, kidney basin in lysol solution for 1 hour, wash with detergent and dry it under sunlight.
- ▶ Bath basins, multi-bin, bucket, jugs, mugs are washed with soap solution and dried in sunlight.
- ▶ Rubber sheets (mackintosh) are to be cleaned with lysol, dried, powdered and replaced
- ▶ Soak the thermometer tray and its contents in 7% lysol after cleaning.
- ▶ Utensils used by the patient are washed, boiled and replaced.

### 10.3 HOUSEKEEPING IN THE OPERATION THEATRE

Theatre complex should be absolutely clean at all times. Dust should not accumulate at any region in the theatre.

Soap solution is recommended for cleaning floors and other surfaces. Operating rooms (ORs) are cleaned daily and the entire theatre complex is cleaned thoroughly once a week.

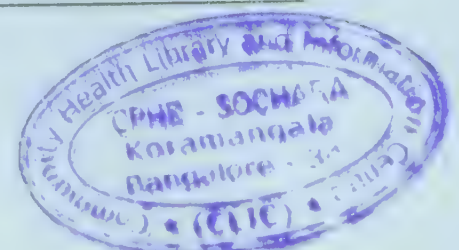
**Before the start of the 1st case :**

Wipe all equipment, furniture, room lights, suction points, OR table, surgical light reflectors, other light fittings, slabs etc with soap solution. This should be completed at least one hour before the start of surgery.

**After each case:** (Also refer to the section on guidelines for surgical procedures in the chapter 'Specific areas of patient care')

➔ **Linen & gloves**

Gather all soiled linen and towels in the receptacles provided. Take them to the service corridor (behind the theatre) and place them in trolleys to be taken for sorting. The dirty linen is then sent to the laundry. Use gloves while handling dirty linen.



### ➤ **Instruments**

Used instruments are cleaned immediately by the scrub nurse and the attender. Reusable sharps are decontaminated in lysol/hypochlorite and then washed in the room adjacent to the respective OR by scrubbing with a brush, liquid soap and vim. They are then sent for sterilisation in the TSSU. In the septic theatre alone the instruments are sent in the instrument tray for autoclaving. Once disinfected, they are taken back to the same instrument cleaning area for a manual wash described earlier. They are then packed and reautoclaved before use.

### ➤ **Environment**

Wipe used equipment, furniture, OR table etc., with detergent and water. If there is a blood spill, disinfect with sodium hypochlorite before wiping.

➤ Empty and clean suction bottles and tubing with disinfectant.

### **After the last case**

The same procedure as mentioned above is followed and in addition the following are carried out.

➤ Wipe over head lights, cabinets, waste receptacles, equipment, furniture with a detergent.

➤ Wash floor and wet mop with liquid soap and then remove water and wet mop with a disinfectant solution.

➤ Clean the storage shelves, scrub & clean sluice room.

### **Weekly cleaning procedure.**

➤ Remove all portable equipment.

➤ Damp wipe lights and other fixtures with detergent.

➤ Clean doors, hinges, facings, glass inserts and rinse with a cloth moistened with detergent.

➤ Wipe down walls with clean cloth mop with detergent.

➤ Scrub floor using detergent and water.

➤ Stainless steel surfaces - clean with detergent, rinse & clean with warm water.

➤ Replace portable equipment: Clean wheel castors by rolling across towelling saturated with detergent.

➤ Wash (clean) and dry all furniture and equipment.(OR table, suction holders, foot & sitting stools, Mayo stands, IV poles, basin stands, X-ray view boxes, hamper stands, all tables in the room, hoses to Oxygen tank, kick buckets and holder, and wall cupboards.)

➤ After washing floors, allow disinfectant solution to remain on the floor for 5 minutes to ensure destruction of bacteria.

➤ Do not remove or disturb delicate equipment

➤ While wiping cabinets, see to it that the solution doesn't get inside and contaminate sterile supplies.

➤ Operating rooms and scrub rooms should never be dry dusted.



### **Maintenance and Repairs.**

- Machinery and equipment should be checked, cleaned and repaired routinely on Saturdays.
- Urgent repairs should be carried out at the end of the days list.
- Air conditioners, and suction points should be checked, cleaned and repaired on a weekly basis .
- Preventive maintenance on all theatre equipment to be carried out every Saturday, and major work to be done at least once every year.





## 11. SERVICE UNITS

This section deals with the units that do not necessarily come into direct patient contact, but have a vital role in infection control in the hospital. Personnel in these areas also have varying degrees of risks of acquiring infection. Therefore, infection control measures are to be strictly enforced in these areas.

### 11.1 LABORATORIES (Clinical Microbiology, Clinical Virology, Clinical Pathology and Clinical Biochemistry)

#### A. Collection of specimen

Refer to the chapter "Techniques" for details on collection of specimens for culture and for other investigations.

#### B. Policies for laboratory personnel :

(Refer to the chapter 'Employee Health Programme' also)

##### ✱ The basic principle is strict adherence to universal precautions

- ***All clinical material must be considered potentially infectious***
- All procedures and manipulation should be performed carefully to minimise the creation of aerosol or spillage.
- For containment facility, a biological safety cabinet with 'evacuation' and 'burn out' attachment should be used for all procedures involving clinical material.
- Gloves must be worn for all procedures on infective material. Eye protection and mask will be required when splashing is a possibility.
- Personnel with open skin wounds, extensive eczema or dermatitis should avoid handling specimens of blood and infectious body fluid.
- ***No mouth pipetting is to be performed***

##### ✱ A written protocol should be available for

- All procedures involving infective material carried out in the lab
- Disinfection & sterilization of various items used in the lab
- Disposal of various infective items

When centrifugation is necessary, stoppered individual containers and sealed buckets must be used. If the specimen container is broken or leaking, then the complete unit should be autoclaved with the lid of the bucket left loose. Buckets should be routinely disinfected at the end of day, whether or not breakage has occurred. To prevent aerosol spread, open the machine only when the centrifuge has come to a stop.

If breakage has occurred, report the incident to the supervisor and treat the situation like a blood spill.

Disinfect contaminated surfaces with an appropriate disinfectant.

In order that infective material is not spread to other areas:

- All personnel must immediately remove their gloves and protective clothing following completion of work and wash their hands before moving on to other activities.
- Gloves should not be worn when coming out of the workplace. □
- Items of common use (doorknobs, telephone, etc) are to be handled only with an ungloved hand.

Reporting of accidental exposure to blood borne pathogens - Refer to the chapter "Employee health programme".

### C. Disposal of laboratory waste:

Various categories of waste generated from the lab should be segregated according to the procedure followed in the hospital (refer to the chapter on "Hospital waste management")

All cultures should be decontaminated by autoclaving before it leaves the laboratory or should be sent for incineration in properly secured bags.

All disposable specimen containers should be discarded. Reusable ones are cleaned only after disinfection by soaking in 1% sodium hypochlorite solution or after autoclaving.

### D. Role of laboratories in infection control in the hospital and community:

✱ Laboratories should notify the following diseases to the Medical Superintendent :

#### **Clinical Microbiology**

Anthrax  
Cholera  
Diphtheria  
Enteric fever  
Meningococcal disease  
Plague  
Tuberculosis  
Typhus (in consultation with clinicians)

#### **Clinical Virology**

HIV

#### **Clinical pathology**

Malaria

✱ Microbiology department takes an active part in

- routine monitoring of sterilization & disinfection in various parts of the hospital
- investigating outbreaks of nosocomial infections
- making antibiotic susceptibility data available to clinicians periodically

➡ *Tests which have potentially long exposures to blood (eg: estimation of bleeding time) are not performed on patients known to harbour blood borne pathogens.*

➡ *Serum or plasma of patients known to harbour blood borne pathogens is not stored.*



## 11.2. BLOOD BANK

Universal precautions are strictly followed while collecting and handling blood. (Refer section on universal precautions in the chapter 'Preventing transmission of blood borne pathogens').

### Blood Donors

#### ***Screening of donors for infections:***

- ✱ All donors are screened for history of recent and past infections.
- ✱ Donors are temporarily deferred for the following conditions and are advised to donate at a later date:
  - Fever, sorethroat and common cold,
  - Antibiotic therapy during the past week,
  - Dental work during the past week,
  - Jaundice during the past 1 year,
  - Infectious diseases such as malaria during the past year,
  - Possible exposure to rabies during the past year,
  - Any recent viral infections like chicken pox, and measles,
  - Recent administration of live attenuated viral vaccinations for polio, rabies, small pox, measles, mumps and yellow fever.
- ✱ Donors are permanently deferred or deferred for longer periods if they give history of
  - Sexually transmitted disease
  - HIV Infection or AIDS,
  - Sexual exposure to any person having venereal infections.
  - History of a visit to a commercial sex worker or multiple sex partners.
- ✱ A personal evaluation form is available in the donor area for donors to exclude themselves without identifying the cause for exclusion.
- ✱ All professional donors are rejected.
- ✱ After evaluation of history, a limited physical examination by a medical doctor is done to exclude any clinical evidence of infections.

#### ***Investigations***

The donor's blood is tested for

1. Malarial parasites,
2. Microfilaria
3. VDRL
4. HBsAg
5. HIV I & II antibodies.
6. Hepatitis C virus
7. Cytomegalovirus testing is done if requested for by the clinician.

**HIV and Safe blood transfusion**

Since screening of blood does not ensure complete safety since people in the window period would test negative, an attempt to ensure that the donor is not in this period by asking questions regarding sexual practice is essential. Screening of a sample of blood is also essential to ensure safety. The sample should be tested for HIV by a highly sensitive screening procedure. Since HIV-1 and HIV-II are prevalent in India, tests which would identify either infection is preferred to those that identify HIV only. However, in most parts of India at the present time, the presence of HIV-II is low; hence, the lack of availability of HIV-I & II test system should not be an excuse for not using a good screening procedure for HIV-II. If the test is reactive, the donor/donated unit of blood is not to be accepted. However, the donor should not be diagnosed of HIV infection on the basis of single screening test.

**Blood Donation Procedure:**

- Safety measures are taken to prevent infection in recipients.
- The technician should wash his hands with soap and water before bleeding the donor. (Refer to the section on hand washing in the Chapter "Techniques").
- The linen should be changed if there are blood stains.
- The venipuncture site should be cleaned with soap and water and Povidone-iodine.
- The donated blood should not be kept at room temperature to prevent bacterial multiplication. If platelets are to be prepared the unit should be kept at 22°C. If Red cells, FFP (Fresh Frozen Plasma) and Cryoprecipitate are to be prepared the collected blood should be kept at 4°C before components are made.

**Component preparation and storage**

- Component preparation and storage should be done in a clean dust free room and "Refrigerated centrifuges" should be used for separation. Components are made in a closed bag system.
- All extra tubing in blood collection system are destroyed making sure that they can not be reused.
- All stored red cells, platelets, and liquid plasma should be physically checked every day for haemolysis and turbidity. Random blood cultures should be done on stored blood components.
- All refrigerators and freezers should be fitted with alarm systems and temperature maintenance should be checked at regular intervals during the day.

**Infected units of blood and components**

If any unit collected is found to be positive for an infectious disease, all samples and units from that individual are collected, kept separately and incinerated. The blood to be discarded should preferably be rendered non-infectious with hypochlorite or, an other method of disinfection. In a closed waste water disposal system there may be no ill effects of pouring out blood. However when large quantities (ie. more than 2-3 pints) are involved it is advisable to send it directly for supervised incineration.



**Handling of patients and donor samples**

- Universal precautions are to be strictly followed.
- No mouth pipetting is allowed.
- All used glass ware and sample containers are left in 1% sodium hypochlorite before cleaning.
- All disposable needles are to be disposed in the sharps container.
- All reusable needles and glass syringes need to be disinfected with 7% lysol before sending them to CSSD for autoclaving.
- If there is any spill of blood in any area the area is cleaned after decontamination with 1% sodium hypochlorite or 7% lysol.

**Issuing blood for transfusion:**

- All units of blood and components issued from the Blood Bank are checked for any evidence of hemolysis icterus or turbidity to prevent transfusion of possibly infected units.
- No unit is accepted back in Blood Bank if kept at room temperature for more than 15 minutes.
- No unit is allowed to be stored in the ward refrigerators.
- All units issued should be negative for Malaria, Microfilaria, VDRL, HBsAg, HCV, & HIV I & II antibodies.

**Transfusion reaction investigation.**

- In case of transfusion reactions the transfused units are sent for microbiology culture.
- Since there is still a possibility of transmission of infections by blood transfusion we encourage autologous transfusions.
- Clinicians are advised to give fewer transfusions and for this continuing medical education is encouraged.
- The Hospital transfusion committee oversees any problems in the Blood Bank functioning and blood usage.

**Infection Control for Staff:**

Refer to the chapter 'Employee Health Programme' and to the section on Policies for laboratory personnel on page 75.

### **11.3. TISSUE PATHOLOGY & AUTOPSY ROOM**

Workers in the pathology lab are among those exposed to the blood, body fluids and tissues which are potentially infectious.

All workers are advised to adopt Universal Precautions in the work place (refer section on universal precautions for details). Refer to the chapter on employee health policies as well.

#### **1. Protective Clothing**

- In the laboratory, where tissue specimens are handled, gloves and rubber/plastic aprons are recommended for protection of the health care worker.
- In the autopsy room, in addition, over shoes with plastic foot covers to make them impervious, masks, goggles and elbow length gloves are recommended.

#### **2. Work Surfaces**

Work surfaces should be treated as blood spills (refer to page 19 on management of blood spills)

#### **3. Handling of fresh, unfixed tissue**

- Formalin is injected into the body before the autopsy is begun.
- During an autopsy, the tissue should be transferred to 10% formalin as soon as possible.
- Photography of wet specimens should be done in the autopsy room itself and dedicated space is necessary which can be thoroughly cleaned after use.

#### **4. Disposal of Wastes and Contaminated Material**

This is conducted as per the hospital guidelines (refer to the chapter on hospital waste management - page 67).

#### **5. Routine Biopsy and Autopsy Processing**

- Tissue should be fixed in 10% formalin as soon as possible and left undisturbed for 24-48 hours depending on the size of the specimen.
- Transport of tissue specimens to the laboratory is recommended after fixation in 10% formalin. Spill proof, screw-capped bottles are used and they are sent in leak-proof plastic bags.
- Tissues are processed after 24 hours' using all precautions as for fresh tissues.

#### **6. Instruments:**

Instruments in the lab or autopsy room are decontaminated either by autoclaving or by standing in freshly prepared sodium hypochlorite solution for 30-60 minutes. They are then washed in detergent and dried.

#### **7. Personnel:**

- Entry to the autopsy area and laboratory is restricted.
- Autopsy room staff need to have regular physical check up.
- Accidental exposure to blood and body fluids should be dealt with according to the protocol given in the chapter on employee health programme.



## 8. Body bags

Body bags are available to transport bodies. All bodies will be covered with a body bag before leaving the mortuary. Routine double bagging of patients known to harbour blood borne pathogens is not necessary.

## 9. Death due to Anthrax

If a patient with Anthrax dies less than 48 hours after antibiotics have been started :

- ⇒ Bag the body as usual.
- ⇒ Minimise handling of the body .
- ⇒ Advise relatives to conduct last rites as soon as possible.
- ⇒ Avoid contact with exuding body fluids.
- ⇒ Soiled clothes should be burnt or buried with the body.
- ⇒ In case deep burial is not possible, cremation is recommended.

## 11.4. ENGINEERING DEPARTMENT

The preventive maintenance of all equipment will ensure efficiency and reduce chances of contamination of air and water. The proper care and maintenance of the entire physical structure will also reduce accumulation of dust and spores in the environment. Thus the engineering dept and its personnel are important links in the chain of activities towards hospital infection control.

### A. General guidelines:

1. Engineering personnel shall report to the ward sister prior to commencing work in a patient's room or area, and follow her directions with regard to dressing, scrubbing etc. Engineering personnel shall check out with the ward sister upon completion of work.
2. Engineering employees shall maintain a neat, clean appearance at all times. Personnel hygiene such as washing after using toilet facilities etc will be observed.
3. All engineering personnel must be aware of universal precautions.
4. Prior to entering areas requiring sterile attire such as the OR, engineering employees shall wear the prescribed clothing. Engineering personnel shall check in and out with the permission of the supervisor.
5. Hand washing should be followed before and after leaving the patient care area.

### B. Plumbing job guidelines:

1. Hospital water supply systems shall not be connected with any other piping system or fixtures that could allow contamination without the use of adequate air gaps or approved back flow preventers or vacuum breakers.
2. When using implements to unstop faulty drains, wear rubber gloves
3. When rodding out main sewer lines, or when exposed to gross contaminated wastes, wear rubber boots and rubber gloves.
4. After exposure to sewer lines or gross contaminated waste, clean exposed areas of body with soap and water. Change uniform if necessary. Do not return to patient care areas before cleaning up.



### **C. Physical barriers between repair area and patient care facility.**

When any construction or repair work is carried out in patient care areas the supervisors must inform the Medical Superintendent, who will inform the heads of the concerned departments so that patients may be shifted, if required.

When work is carried out in areas with immunocompromised patients or that require a sterile atmosphere, adequate physical barriers must be present to prevent the spread of fungus and other such microbes, through dust and debris generated.

All areas that require a sterile atmosphere must be fumigated before use following construction work.

### **D. Ventilation systems.**

Regular cleaning of all window AC filters must be carried out in a systematic manner throughout the hospital. AC filters should be placed in formalin solution for at least an hour at each cleaning. In areas such as the microbiology lab where handling of infected material is carried out, more frequent checks and cleaning of AC filters is required.

In areas where central air-conditioning is used, the moisture of the air and the ventilatory air changes must be carefully monitored.

### **E. Incinerator.**

All personnel working at the incinerator site must strictly follow universal precautions. Material to protect workers is available with the respective supervisors. In case of sharps injury, the incident must be reported immediately by the supervisor to the SSHS.

In case of breakdown or repair of the incinerator the Medical Superintendent, the General Superintendent and the HICC must be informed so that the required emergency measures may be taken.

## **11.5. DIETARY DEPARTMENT**

The Dietary department ensures that food prepared and served to patients, visitors and employees is received, stored, assembled and served in a manner that avoids contamination. The aim is to prevent food/water borne infections

### **I. Production kitchen**

All food is prepared and served into containers/trays in the main kitchen and then sent to the wards.

#### **A. Food Temperatures**

1. Cold food items are maintained in refrigeration at a temperature of 4-8°C or below. Walk-in storage facilities are maintained at the following temperatures. The temperatures are checked daily and a log is maintained of the temperature.

Meat ,Fish ,Chicken storage	-18 to -20°C
Vegetables and fruits	4 - 8°C
Dry stores	Room temperature



2. Foods prepared to be served cold are cooled from their preparation temperature to 4°C or below. The cooling period shall not exceed 4 hours.
3. Hot foods are held at an internal temperature of 63°C or above.
4. Both hot and cold food items will be transported in such a manner that appropriate temperatures will be maintained during the transportation of the food.

### ***B. Special formula food - Blended Diet.***

Infant formulas and other formulae prepared by the dietary department are subject to specific preparation and storage policies and procedures that may be found in the Dietary Department Manual. These are microbiologically checked only when epidemics occur.

## **II. In-patient Food**

Trays of patient food are assembled in the kitchen, supervised by professional and trained personnel. They are taken to distribution points (floor kitchens) and served by dietary personnel.

Dietary workers are taught to observe universal precautions to protect themselves.

The returned trays are heat treated to render the items sanitised (wash temperature 65-70°C, rinse temperature 85-95°C).

## **III. Dietary personnel**

Dietary personnel are taught to protect food consumers from the body substances of dietary personnel. Barriers are provided for the use of dietary personnel, and the following practices are taught and supervised.

For details regarding health care of the workers, refer to the chapter on Employee health policies

### ***Handwashing***

Personnel wash with soap and water their hands and exposed portions of their arms before starting work. Handwashing includes special attention to the fingernails and areas between the fingers.

Handwashing should be mandatorily repeated after using the toilet, eating or drinking, arranging or combing the hair, touching the face, nose or eyes, contact with unclean equipment and work surfaces and after handling raw food

### ***Personnel habits***

- keep clothing free from obvious dirt and food spills.
- use hair nets (hair restraints) while on duty.
- use utensils to handle food whenever possible.
- do not consume food or drinks in the food, preparation or serving areas.
- do not use tobacco products in any form while engaged in the preparation or serving of food.

## **V. Disposal of waste from the dietary department.**

Food returned to the kitchen is discarded. These and other dietary wastes are kept in bins lined by black plastic bags outside the dietary department which are removed regularly.

## **VI. Outbreaks**

When a food borne illness is suspected, the HICC is notified. The Microbiology department will obtain specimens from the symptomatic individuals and from suspected food. The HICC will be responsible for obtaining significant histories and conducting the investigation of a suspected food borne illness.

## **VII. Equipment & Housekeeping**

Refer to the section on housekeeping. Additional points may be obtained from the dietary manual

### **11.6. LAUNDRY SERVICES**

Although the risk of infection appears to be low, soiled linen can be a source of large amounts of microbial contamination which may cause infections in hospital patients and personnel. In addition, improperly processed linen can cause chemical reactions or dermatitis in those who come in contact with them. A hospital's linen service should process soiled linen so that the risk of disease to patients who may be unusually susceptible or to employees who may handle linen is avoided. Adequate procedures for collecting, transporting, processing, and storing linen should, therefore be established.

Washing with hot water and detergent has been shown to result in adequate cleaning of laundry. If needed for other reasons, bleach or ironing will reduce microbial contamination. Textile softeners added in the final rinse, though of no value in preventing infections, make linen easier to handle and rewash, and they reduce lint.

#### **Handling of soiled linen**

- a. Soiled linen should be handled as little as possible and with a minimum amount of agitation to prevent gross microbial contamination of the air and of persons handling the linen.
- b. All soiled linen should be bagged or put into special carts at the location where used.
- c. Linen soiled with blood or body fluids, and all linen used by patients diagnosed to have HIV, HBV, HCV and MRSA, is to be decontaminated in the ward by soaking in 7% lysol for at least 1 hour and then sent to the laundry.

#### **Pre-rinsing and handling linen in the wards**

Linen is soaked with soap and water overnight in the wards if they are soiled with blood, body fluids and faeces. Linen used for patients with MRSA, HIV, Hepatitis B, cholera and linen from the isolation ward is decontaminated in the ward by soaking it for one hour in 7% lysol, before it is sent to the laundry.

#### **Sorting soiled linen**

In the laundry, hand washing facilities and protective garb (e.g., gowns, gloves and goggles and masks) are available to personnel who sort laundry. In the wards, sorting of laundry should be done only in the sluice rooms and not at the bedside



### Hot-Water Washing

Linen is washed at 80-90°C for over 20 minutes with a detergent in water since this is an effective method for cleaning and killing most vegetative bacteria.

### Clean linen

The clean linen section should be cleaned every day; Cupboards and walls are damp dusted and the floor mopped.

All clean linen should be stored and transported in carts used exclusively for this purpose. Clean linen is delivered to the user in such a way as to minimize microbial contamination from surface contact or airborne deposition.

It is desirable to protect linen in individual patient care areas. But once clean linen is distributed for individual patient use, protection or covering is not required. There is to be a functional separation of clean and soiled linen during storage and transport.

### Sterile Linen

Only linen used in procedures requiring sterile technique should be sterilized. This process is done in the TSSU and CSSD.

## 11.7 CENTRAL STERILE SUPPLIES DEPARTMENT (CSSD)

The purpose of the CSSD is to provide all the required sterile items in order to meet the needs of all patient care areas (with the exception of instruments used in the operation theatre, which are sterilised in the theatre itself).

### Items supplied by the CSSD:

- ✓ Syringes
- ✓ Metal needles (used for loading solutions into a syringe)
- ✓ Instrument packs for various procedures
- ✓ Gloves
- ✓ Dressing pad & stump pad
- ✓ Dressing packs, cotton & gauze

### Sterilization:

#### **Moist heat sterilization:**

This is used for steel instruments, latex rubber tubes, gloves, dressing packs, cotton and gauze.

CSSD has electric autoclaves, cyclomatic autoclaves and a high pressure autoclave. The cyclomatic and high pressure autoclaves operate using a central steam supply.

#### **Dry heat sterilization:**

This is used for sterilizing metal needles (including LP and bone marrow aspiration needles), glass syringes and vaseline gauze.

Hot air ovens and infra-red radiation are used to get a temperature of 160°C for 1 hour.

### **Chemical sterilization:**

Heat sensitive items such as cautery cables, electrodes, rubber and parts of operating microscopes are sterilised using chemicals.

Sterilizers of capacities varying from 40 to 480 litres are available for ethylene oxide sterilization. A temperature of 50°C is maintained.

### **Protocol**

A "one-way" pattern of work-flow is observed in the department. Items proceed in a step-wise manner from an unsterile area to the sterile area.

Area 1 - Items are received from the wards.

Area 2 - Items are disassembled to ensure effective cleaning.

Area 3 – Items are cleaned.

Area 4 – Assembling items that are needed for each pack.

Area 5 – Checking if all items needed for a particular pack are present.

Area 6 – Packing is done in such a way as to prevent any part of the contents from getting exposed to air.

Area 7 – Sterilization.

Area 8 – Storing is done in such a manner as to maintain sterility and the items are stored according to dates, so that older items are issued first.

Area 9 – Distribution to the wards takes place from this area.

### **Collection and distribution of items:**

- All items are collected and distributed twice a day.
- Syringes and needles are transported using trolleys that have two compartments. The upper compartment is used for sterile items and the lower one is used for unsterile items. Unsterile items are collected and at the same time, the sterile items are given to each ward.
- For other items, an open trolley is used to collect unsterile items from various areas of patient care. The quantity of each item that is collected is recorded in a book. These items are transported to CSSD. Another set of personnel transport sterile items to the various wards, depending on the requirement.
- Items which have crossed the expiry date should be returned and new ones obtained.

### **Monitoring of sterilization**

- All sterile items should come in packs, which are secured firmly with tapes. All packs should have the chemical indicator tape showing adequate sterilisation. Users should verify this and report if there is any breach.
- The autoclave has thermocouples that indicate the temperature inside the autoclave. Pressure gauges measure the pressure of the autoclave chamber.
- In addition to chemical indicators, microbiological surveillance is done every week. Swabs dipped in *B.stearothermophilus* spore suspension are kept in the autoclaves to check their efficacy.



## **Red bags**

Red bags are used to discard CSSD items that are used on patients harbouring blood borne pathogens or MRSA. These bags are a property of CSSD and are given to wards at the time of admission of such patients. These bags are taken to CSSD before 11am and placed on a trolley. The trolley with all the bags placed on it is then autoclaved. The ward attenders take the red bags back to the ward where they are opened, the contents sorted and sent to CSSD again along with the other items.

## **11.8 PHARMACY**

The pharmacy in Christian Medical College Hospital prepares parenteral, oral & ophthalmic preparations and medications for external use. Precautions taken for parenteral preparations alone are detailed below.

The section responsible for the manufacture of all parenteral preparations consists of the following designated areas:

### ***Area for washing***

New glass bottles are washed in tap water to remove dust and are rinsed in distilled water.

### ***Preparation room***

Preparation of solutions is done in strict aseptic settings. Distilled water is used and all solutions are prepared at a temperature higher than 80°C by heating with steam. Only one solution is prepared in bulk every day. The solutions are prepared in batches and each batch is given a batch number. The solutions are prepared in stainless steel barrels and then transported in steel containers to the area designated for filling bottles with the solution.

### ***Area for filling bottles with the prepared solution***

This is to be done under strict asepsis using sterile syringes which are automatically controlled.

### ***Autoclave room***

- The bottles are subjected to autoclaving at 116°C for 30 minutes. The temperature attained by different parts of the autoclave and the trolleys are strictly monitored using thermocouples and care is taken so that all parts of the autoclave are heated upto 116°C.
- After autoclaving, the bottles are kept standing for 24 hours. A sample is checked for suspended particles by shaking the bottle and visualizing it against a black and a white background. If satisfactory, the bottles are labelled.
- The bottles are then stored for a week, after which a sample is sent for pyrogen & sterility testing. If found satisfactory, they will be released to the patient care areas.

**General measures that are taken to ensure sterility:**

- Entry into sterile area is restricted.
- The sterile area is maintained at a positive pressure and laminar flow is maintained.
- Ultraviolet lights are turned on when the sterile area is not being used.
- Before entering the rooms, individuals have to remove their footwear and then pass through two ante-rooms.
- Ante-room 1 is for washing their feet in tap water and for soaking their feet in an antiseptic solution.
- The second ante-room is for changing into a sterile garment, for scrubbing and wearing gloves, masks and overshoes.
- Personnel with ill-health are not allowed to enter the sterile area.
- Fumigation of the sterile area is done during weekends using formaldehyde.
- Colony counts are performed in various parts of the sterile area every day.



## 12. SPECIFIC AREAS OF PATIENT CARE

### 12.1 DENTAL CLINIC

Universal Precautions should be followed strictly.

#### 1. Prevention of cross infection:

Contamination of the work area must be reduced or eliminated by using:

- disposable plastic barriers over light handles and the x-ray tube
- cloth sleeves for the micromotor
- Overgloves to handle material bottles, mixing slabs, records etc.
- Cheattle forceps and sterile forceps to pick up instruments and gauze
- Suction to reduce aerosol formation and to avoid spitting
- Antiretraction valve for air-rotor handpieces.

All procedures especially minor surgery and restoration must be performed with the help of a dental assistant who can manage the suction and also maintain aseptic technique.

Hypodermic needles, suture needles and blades are disposable. Syringes used to load a local anaesthetic should be discarded after single use and not be re-used to draw solution.

Handpieces and burs should be disconnected after use.

#### 2. Staff protection measures:

- All clinical staff, including attenders must be immunised against Hepatitis B and records of immunisation status maintained.
- Apron, gloves, masks and goggles should be worn by staff during procedures. In the consultation room, clinical examination can be done with sterile diagnostic instruments and gloves must be worn for intra-oral palpation. Double gloving is mandatory for procedures requiring inter-dental wiring.
- The staff must take care to avoid injury from sharps, including wires, burs, reamers, files and pointed instruments like the explorer. Examination gloves must be worn while cleaning instruments.
- Dispose sharps into the assigned container. Needles should not be recapped after use but must be discarded immediately into a puncture resistant container.
- Cleaning of the clinic is according to the hospital guidelines found in the chapter on housekeeping
- Should there be any spillage of blood and body fluids - the area should be covered with adsorbent material, saturated with 1% sodium hypochlorite and left for 10 minutes. It should then be mopped up by a person using examination gloves and protective footwear. Following this, clean the area with detergent and water.

### 3. Sterilization and disinfection of instruments

a) The following instruments required for each day are packed and sterilized at 160°C for 1 hour in a hot air oven:

- ➔ Extraction forceps and elevator.
- ➔ Hand scalers
- ➔ Filling instruments(packed as sets)
- ➔ Instrument trays and tumblers
- ➔ Mouth mirror and dental probes
- ➔ Impression trays

b) The following are autoclaved:

- ➔ Air rotor handpieces
- ➔ Ultrasonic inserts
- ➔ Root canal instruments
- ➔ Surgical towels
- ➔ Suture material
- ➔ Cotton & gauze
- ➔ Autoclavable plastic suction tips, cautery handpiece.

c) The following are immersed in 2% glutaraldehyde solution for a minimum of 3 hours, after cleaning well to remove blood and secretions:

- ➔ Surgical burs
- ➔ Diamond air rotor burs

*They are to be washed in distilled water before use.*

### 4. Additional precautions for patients known to harbour blood borne pathogens:

- Gloves should be worn routinely even for examination. Appointment for them are given towards the end of the day. They should be treated in a single chair room.
- Dental chair and unit used should be covered with water-proof sheeting (barriers). A disposable plastic bag should be placed inside the waste basket with the edges turned over its rims. All unnecessary instruments and equipment should be removed from the room before treatment. The surgeon and an assistant should strictly follow universal precautions and wear an impervious surgical gown, cap and mask (preferably disposable). Double gloves should be worn for all procedures.
- Instruments needed for treatment should be selected in advance and kept in a tray with cover. Small quantities of any consumable material should be dispensed before the procedure and surplus discarded.
- Aerosol formation should be limited by employing suction and reducing or avoiding the use of air rotor instruments. Suction bottles should contain 30 ml of 2% glutaraldehyde or 60 ml of 1% sodium hypochlorite. After surgery, they should be carefully rinsed and autoclaved.
- After the procedure the disposable gown, mask, cap, plastic barriers and all the materials coming into contact with the patient, including gauze, should be discarded into bins lined with a yellow plastic cover. The bag is then placed in a cardboard box and sent for incineration.
- Instruments should be collected separately and sent for autoclaving in a red bag
- Linen, should be soaked in 7% lysol for 1 hour and then sent for laundering.



## 12.2 EMERGENCY SERVICE

**Universal precautions are to be strictly adhered and all patients are to be treated as potentially infected with blood-borne pathogens. Importance of this cannot be over emphasised in this area.**

1. Wash hands with soap and water before and after patient contact.
2. Wear gloves preferably for all patient contact. It is a must for all invasive procedures, however minor. Examination gloves are placed in the shelves in all patient care areas.
3. Protective eyewear for all the Emergency Service staff has been issued. Use them whenever body fluid spill is anticipated.
4. Wear masks for all situations where a splash is expected, and where infection that spreads through the respiratory route is a possible diagnosis.
5. Wear plastic aprons, in addition to a mask if splash to the body area is expected.
6. Use disposable needles and discard them into the sharps container which is placed in all patient care areas. Dispose IV canula stilettes, scalpel blades and razor blades into the sharps containers immediately after use.
7. Attenders and Sweepers are to wear gloves while handling lab samples and performing janitorial work.

### **Additional precautions for patients known to harbour blood borne pathogens:**

- Use plastic aprons during procedures where body fluids may be spilt.
- Disinfect all items following discharge, transfer or death of the patient (as per hospital protocol – refer to the chapter on housekeeping). Mattress, pillow and mackintosh are to be disinfected with 1% sodium hypochlorite solution and dried in sunlight.
- Refer to pages 19 – 20 as well.

### **Infectious diseases**

Refer to the chapter on Isolation Policies.

### **Wound and Skin Infections**

- Hands are to be washed before and after handling the patient.
- Wear gloves while handling infected wounds.
- Cover the wounds (as far as possible) before transferring the patient.
- Dispose waste as per hospital guidelines.

### **Trauma**

Use protective equipment such as gloves, mask, gown, apron and goggles under appropriate situations.

### **Burns**

The patient is received on a stretcher with clean sheets and transferred immediately to the burns unit without entering the Emergency Services

### **Housekeeping**

- The treatment rooms and trauma resuscitation room is cleaned with soap and water after every patient. Blood spills are disinfected by using Dakins solution, for a contact time of 10 minutes.
- Equipment and instruments that are to be reused are cleaned before sending it for sterilization.
- Discard medical waste as per the guidelines given in the chapter on Hospital Waste Management.

## **12.3 INTENSIVE CARE UNIT**

### **A. Medical Intensive Care Unit (MICU)**

#### ***Design of the unit***

- \* Space around and between beds should be adequate for placement and easy access to equipment and to patients.
- \* A single, closed cubicle is used only for patients needing isolation; eg. open tuberculosis, anthrax, enteric fever, cholera, MRSA colonisation or infection, colonisation or infection with other multi-drug resistant organisms.
- \* Good house keeping practices should be followed. This includes regular cleaning of all areas, maintenance, linen and curtain changes etc. Clean floor at least four times a day.

#### ***Procedures to be followed by health care personnel.***

- \* Handwashing: Importance of this cannot be over-emphasised in the ICU setting.
- \* Universal Precautions: as appropriate, should be followed by all staff while handling patients or samples (refer to the section on Universal Precautions). Wear plastic aprons and gloves for all procedures. Remove and discard them immediately after each patient. Use gloves for all patient contact. Wear masks while examining patients with 'uncertain' diagnosis.

#### ***Sterilisation and disinfection:***

Refer to the section on sterilisation and disinfection. Please note the following points also:

- a) UV light adjusted to reach all parts of the room may be used for 30 minutes each, before a new patient is admitted in isolation room, this does not however, replace any other measures of cleaning and disinfection. (Refer to the section on house-keeping)

- b) *Instruments*

Although disposable items are ideal, reusable items are often used, for reducing the cost.

Separate thermometers should be used for each patient.

Separate AMBU bag and mask should be used for each patient. This should be disinfected before use on another patient. (Refer to the chapter on care of systems and indwelling devices).

Trolleys are to be adequately loaded and should be used for bedside procedures.



### ***Handling of haemodialysis unit in the MICU***

- Before filling the water tank in MICU, make sure that the lid is firmly closed and that the tank was disinfected within the last 10 days. There will be a layer of bleach at the bottom of the tank. Siphon the bleach out and flush thoroughly with hot water. Check the chloride level in the effluent and when negative, fill the tank with RO (Reverse Osmosis) water.
- After dialysis is complete, the tank and the lines need to be drained completely. Pour 20 litres of 2% bleach into the tank and close it. Ensure that all valves are tightly closed.

#### *Disinfection of the tank with bleach:*

The tank needs to be filled with 2% bleach to dwell for 30-45 minutes. The valves are then opened to flush and fill all the lines. The bleach should dwell in them for 30-45 minutes. Then the system is drained and flushed with hot water 2-3 times. The tank is drained completely and 20 litres of 2% bleach is left in the tank when not in use.

### ***Microbiological monitoring***

Swabs for culture are taken from common dust settling areas and air conditioners once a month. The RO water used for dialysis is also subjected to microbiological testing.

### **B. Surgical intensive care unit (SICU)**

1. Any patient, with communicable diseases or infection or considered potentially infected should be placed in the Isolation Section.
2. Patients without any respiratory or overt wound infection are transferred in directly from recovery room to the clean area .
3. All personnel working in the area must be free from respiratory and any overt wound infection. Universal precautions must be followed (Refer to the chapter on prevention of transmission of blood borne pathogens)
4. All personnel working in ICU are expected to change into the clothes provided including the slippers in the changing room, before entering patient care area.
5. All visitors (medical and non-medical) are excepted to change foot wear and wear a gown over their street clothes before entering the ICU.
6. Entry of other personnel (Laundry, Dietary, CSSD, Stores) are not allowed. They are to use entry points provided at different places for supplying and receiving, goods.
7. Personnel should strictly wash their hands with either soap or a disinfectant after all patient contact.
8. Aseptic precautions are to be followed for all techniques (Refer to the chapters on Techniques & Care of systems and indwelling devices)
9. Housekeeping: Refer to the section on housekeeping. The floor should be cleaned at least 4 times in 24 hours.

### **Disinfection of Ventilators and tubing:**

Refer to the chapter 'Care of systems and indwelling devices'. Please note the following in addition:

- Ventilator tubings are changed every 24 hours. Humidifier jars are autoclaved every 12 hours.
- Each patient is provided with his own Bain's circuit that is to be used during chest physiotherapy and endotracheal suctioning. This is changed every day and is sterilized by gas.
- Catheters used for suctioning are to be discarded and a fresh one used every time.

**Microbiological monitoring:** Every month, swabs are taken for cultures from all dust settling areas, air conditioners, monitors and lights.

### **Isolation Side**

Indications for admission into the isolation side:

- a. Any patient with a communicable disease requiring surgical intervention.
- b. Enteric diseases with perforation.
- c. Draining wounds with airborne pathogens, coagulase positive staphylococcus and beta-haemolytic streptococcus.
- d. Draining wounds with non-airborne pathogens (*Proteus*, *E.coli*, *Pseudomonas*).
- e. Gas gangrene.
- f. Infectious and serum hepatitis with surgical problems.
- g. Tetanus with surgical condition.
- h. Septic abortion.
- i. Poly trauma e.g. following road traffic accident or treated outside.
- j. Obstetric patients with complications, if delivered or operated outside CMC.
- k. Any patient transferred from the ward with potential infection.

Patients sent into isolation are received through a separate door.

When possible one nurse is assigned to care for each patient in the isolation section.

## **12.4 SURGICAL PROCEDURES & ANAESTHESIA**

- ✱ Universal precautions are to be followed for all patients and all procedures. Testing for HBV and HIV are not to be considered completely protective, the reasons being:
  - ➡ Tests cannot detect 100% of infections due to HBV and HIV.
  - ➡ There are other pathogens besides HBV and HIV that can be transmitted through blood and body fluid contact.

Hence, all patients must be considered as potentially infectious and preventive measures taken.

- ✱ Though routine preoperative testing is not mandatory, testing may be done in selected procedures with high risk of percutaneous injury, especially where procedures may need to be modified, or personnel performing / assisting the surgery may need to be changed, based on the result. In such cases, the patient should be checked for HBV, HCV and HIV. Each surgical specialty should make a



list of procedures where routine testing is not warranted and also a list of procedures where testing may be beneficial.

- ✱ The patient should be informed when testing is done for HIV. Patients testing positive should be informed of the result by the surgeon before surgery. The patient is then sent for counselling to the infectious disease clinic.
- ✱ No patient will be denied appropriate care if they test positive for any blood borne pathogen.
- ✱ Hepatitis B vaccination is mandatory for all staff coming into contact with blood or body fluids.
- ✱ Gloves should be worn for all invasive procedures on patients (including venipuncture and starting IV lines). Gloves should be changed BETWEEN procedures. Gloves should not be used to handle any equipment. Health care workers should not leave the operating rooms with gloved hands. Gloves are to be used to sort soiled items.

Examination gloves are sufficient for:

- starting IV lines
- intubation
- sorting out used linen or other unsterile items

Sterile gloves are to be used only for surgery.

- ✱ Plastic aprons, which are to be worn below the sterile gowns, are recommended for the surgical team. They are mandatory in areas where large volume splashes are expected. These are to be removed before leaving the operating room.
- ✱ Masks are to be worn, which cover the nose and lower part of the face completely. Cotton masks are to be changed if visibly soiled or has been soaked due to continuous use.
- ✱ Goggles or other eye protection are recommended where there is a reasonable risk of splash.
- ✱ Protection for the feet (sole and dorsum) is recommended.
- ✱ All invasive procedures, however minor they are, should be carried out with utmost care to prevent injury with sharps.
- ✱ Hand to hand passing of sharps during surgery should be avoided.
- ✱ Utmost care should be taken to ensure safe disposal of sharps.
- ✱ The OR supervisor ensures that appropriate containers for sharps disposal are available in all the operating rooms. Smaller sharps disposal containers are present on all anaesthesia trolleys.
- ✱ Health care workers with any open wounds or weeping skin lesions should refrain from activities, which may result in exposure to blood or infectious body fluids.
- ✱ Health care workers with blood or body fluids on their clothing should change before they use the staff lounge or before scrubbing for the next case.



### **Recommendations for administration of anaesthesia:**

- ✱ Masks and laryngoscope blades used for GA should be cleaned and disinfected using glutaraldehyde for 15 minutes and then cleaned again with soap and water before use on another patient.
- ✱ Cover handles of laryngoscope blades with a plastic cover while in use, and clean with detergent solution before use on another patient.
- ✱ Endotracheal tubes and other equipment which come into contact with the mucosa of the patient or which are visibly contaminated with blood or infectious body fluids, should either be discarded after single use, or disinfected before reuse. If there is a need to reuse any such equipment, it should be done after disinfection with glutaraldehyde or after autoclaving.
- ✱ Routine use of bacterial / viral filters are not recommended, but these may be used for selected patients, for example, those with respiratory infection. These filters have not been proved to prevent bacterial / viral infection, although in-vitro studies have demonstrated their efficacy in preventing bacteria from passing through. There are no such studies done on viruses.
- ✱ As a general infection control measure, the corrugated tubings from the patient upto the soda lime canister must be washed in soap and running water and dried before reuse. In addition, these tubes must be decontaminated by immersing in glutaraldehyde for 10 minutes and then washed and dried once a day or when there is visible contamination with blood.
- ✱ Internal circuits in the anaesthetic machine may be cleaned when the soda lime containers are changed.

### **Care of the environment:**

- ✱ The operating team should take absolute care regarding disposal of blood stained items.
  - All swabs, sponges, etc should be discarded / placed only in the assigned containers / areas.
  - Gloves should be **discarded directly** into the bin lined by a yellow plastic cover.
  - Used instruments should be carefully segregated.
  - Used linen should be collected directly in an assigned area immediately after the surgery, fastened carefully and removed from the operating room.
  - If blood or fluid spill is expected, appropriate measures are to be taken before surgery. For example, small plastic containers for small spills (Neurosurgery) and buckets to collect draining fluids (Urology) are necessary. Each specialty should have a written protocol for this.
- ✱ Protection for furniture and equipment:
  - A plastic cover should be used for tables, armboards, etc and should be mopped clean with soap and water between cases.
  - Equipment should not be handled with gloves that have been used for invasive procedures



- ✱ Waste segregation should be in accordance with the guidelines given in the chapter 'Hospital Waste Management'.
- ✱ Cleaning theatres after a case:
  - Minor spills of blood or infectious body fluid are to be disinfected by pouring sodium hypochlorite (Dakins solution) over the spill and leaving it for 10 minutes. A 1:10 or 1:100 dilution of household bleach may be used instead of Dakins solution. The area of the spill should be cleaned with soap and water. The OR supervisor keeps a stock of bleach available for use in emergencies.
  - For major spills, disinfect as above, and clean the whole room with soap and water.
  - At the end of the day, thorough cleaning of the floor with soap and water is necessary.

### **Microbiological monitoring**

Swabs are taken for cultures every month from all dust settling areas, air conditioners, operating tables, monitors and lights.

### **Service corridor:**

The service corridor runs around the back of the theatre complex. It is connected to all operating rooms. Theatre waste, linen and other dirty material leave the theatre room through this route. This corridor leads to the TSSU (Theatre Sterile Supplies Unit). It is important that asepsis is maintained in this area also. Staff using this corridor should wear theatre attire only. They should not come into the main operating room. The door connecting the service corridor and the main OR should be kept shut at all times except when disposing items from the theatre. Exhaust fans in the dirty corridor are kept working throughout the day.

### **Septic cases in the operating room:**

A separate operating room is used for 'septic cases'. The following cases are considered septic:

- Situations where frank pus is present
- Cases for debridement

This theatre has the facility for being sealed air-tight for fumigation. If the septic OR is closed for some reason, septic cases will be taken up at the end of the regular list in the main OR.

### ***Additional steps to be taken in this area:***

- ✱ Minimise equipment to be used.
- ✱ Remove all items from the OR which cannot be properly sterilized or disinfected and those which are not likely to be used.
- ✱ Cover the bed and armrest with plastic sheets, which will be discarded after the surgery.
- ✱ Keep sufficient containers for collecting used items.
- ✱ Handle used items with forceps or after wearing examination gloves

- ✱ Post one person to wait outside the OR, to obtain additional equipment, supplies, and help.
- ✱ At the end of the surgery, the scrub nurse stays in the OR without removing gloves and makes sure that the used items are carefully disposed.

## 12.5 OBSTETRICS AND LABOUR ROOM

### Policies regarding admission of pregnant women with infection.

#### \* ***Pregnant women suffering from infections:***

Not in labour : Admit in medical wards / isolation ward, just as one would admit a non-pregnant woman with similar illness (refer to the table in Chapter 7). They may be admitted to antenatal wards, if isolation is not required.

In labour : Admit to isolation side of labour room.

#### \* ***Indications for admission to isolation side in labour room:***

Pregnant women with at least 22 weeks of gestation and in labour with:

- ✱ Hepatitis (A, E or unknown)
- ✱ Diarrhoea (severe, watery, with blood and mucous)
- ✱ Known infection with a blood borne pathogen (HBV, HCV & HIV)
- ✱ Suspected or confirmed communicable disease requiring isolation. (see list of conditions requiring isolation - in Chapter 7)

*Note* : If beds on this side are occupied and another patient of the above category comes, the patient with least infectious condition should be shifted to a corner bed in the clean side and be isolated from other patients.

#### \* ***Indications for admission to 'J' labour room:***

- ✱ Women with pregnancies less than 22 weeks, but in labour
- ✱ Patients who need check curettage & colposcopy.
- ✱ Septic abortion (most of the patients with septic abortion are admitted in SICU).

#### \* ***Indications for admission to 'J' ward septic side:***

- ✱ Puerperal sepsis and post partum fever
- ✱ Pregnant women requiring isolation (temporary admission till arrangements are made in isolation ward)
- ✱ Severe infection following gynaecological surgery.

If there are no patients with the above conditions, other patients are admitted in this side when there is lack of space in the general side.

### Labour room.

#### 1. House keeping has to be meticulous.

- ✱ Clean the floor at least four times in 24 hours. One of these should be with detergent and copious amounts of water. Lysol may be used to mop the floor for the remaining times.
- ✱ Any spill of blood or fluids should be immediately decontaminated with Dakin's solution for 10 minutes, mopped dry and then cleaned thoroughly



with detergent and water

- ✱ Environment and equipment should be maintained dust free.
- ✱ Strip the bed and wipe clean with detergent and water after each patient and then once more with 7% lysol. Wear gloves for this procedure.
- ✱ Use fresh linen for each patient.

## 2. Personnel:

Follow universal precautions with absolute care.

- ✱ Sterile gloves, gown, plastic apron, goggles, mask and impervious footwear (covering dorsum and sole) are recommended while conducting delivery and any other procedure where spill / splash is expected.
- ✱ Wear gloves and plastic apron for performing vaginal examination and preparing parts.
- ✱ Anyone with open wounds or exudative skin lesions should not be involved in invasive procedures.
- ✱ Wash hands after each procedure and between patients (refer to the section on handwashing under the chapter 'Techniques').

## 3. Procedures:

In addition to precautions mentioned above, the following are required for specific procedures.

Pads are recommended for hygienic collection of secretions and discharge.

### ➡ Vaginal examination and ARM:

- ✱ Put a clean sheet under the patient. Make sure that the end of the sheet leads into a bucket placed under the cot, for collection of amniotic fluid.
- ✱ Introduce electrodes etc, without damaging maternal tissues. Do not use scalp electrodes if the mother is HIV positive.
- ✱ Chlorhexidine vaginal wash after a vaginal examination reduces the chance of infection.
- ✱ Remove the bedsheet immediately after ARM and send for laundry.

### ➡ Delivery:

- ✱ Conduct delivery in the middle of the cot, to minimise spill onto the floor.
- ✱ Spread a rubber macintosh under the patient and covering the edge of the cot.
- ✱ Keep a bucket under the cot, to minimise direct contamination of the floor.
- ✱ Put a clean sheet under the patient. Make sure that the end of the sheet leads into the bucket placed under the cot, for collection of blood and amniotic fluid.
- ✱ Take care to minimise splash and spillage onto the floor.
- ✱ Perform episiotomies only when indicated, taking care to avoid injury to fingers.
- ✱ Person receiving the newborn should wear a gown and gloves. Receive the baby using clean sheet.

- ✱ Placenta should be collected into the assigned bowl.
- ✱ Discard potentially infectious solid waste into the bucket lined with a yellow bag.

➡ *Care of the newborn:*

- ✱ Follow universal precautions (use gloves, plastic aprons or gowns).
- ✱ Wipe vaginal secretions and discard along with infectious waste.
- ✱ Resuscitation is to be done in the specially designated area.
- ✱ Refer to the section on Nursery given in this chapter.

**4. Disinfection / sterilisation:**

- ✱ *Electrodes:*  
Wash the electrode, sheath and the introducer using soap and water. Then send for sterilisation by ETO.
- ✱ *Rubber tubing, metal cups, forceps etc:*  
Wash and then send for autoclaving.

**5. Waste disposal:**

- ✱ This should be in accordance with the hospital rules.
- ✱ Placenta should be sent to the disposal yard for incineration in a yellow bag.

**6. Patients known to be infected with a blood borne pathogen:**

- ✱ These patients are admitted in a specially assigned area in the labour room.
- ✱ Follow instructions as for similarly infected persons in other areas (refer to the section 4.4 on pages 19 & 20)
- ✱ Since HIV and HBV status can influence the management of individual cases with a view to minimise transmission to the infant, counselling and voluntary testing should be offered to all pregnant women.

## 12.6 NURSERY

**1. Personnel:**

- a. Personnel assigned to the nursery should not be posted in other areas of the hospital.
- b. Annual screening at the SSHS is mandatory.
- c. Personnel should be fully immunised. Rubella vaccination is recommended.
- d. Personnel with upper respiratory tract infections, gastrointestinal tract infections, fever, open lesions or any suspected infection should not be permitted to work in nurseries during their period of illness.
- e. Preferably, only those immune to chicken pox (had a history of chicken pox) should be posted in the nursery. Non-immune roommates of personnel with chicken pox should not work in the nursery.



## 2. Attire:

- a. Scrub attire should be worn by nursery personnel. Short sleeved garments are advised to encourage hand washing.
- b. Gowns are not necessary to enter nurseries (eg. for mothers entering the nursery briefly).
- c. Gowns with long sleeves should be worn when caring for infants requiring isolation. Sterile long sleeved gowns are required by all personnel involved in surgical procedures.
- d. Universal precautions must strictly be adhered to when handling blood and body fluids.

## 3. Hand Washing:

- a. Nursery personnel should wash hands and forearms with Chlorhexidine, antiseptic solutions, or soap and water for 2 minutes at the beginning of every shift. Also wash hands for 15 seconds or more before and after handling any infant. Dry with a fresh towel. Commercially available hand disinfectants such as 'hand-rub' may be used.
- b. Mothers who come into the nursery to handle or feed their babies should have bathed and changed that day. They should wash their hands with soap and water in the nursery, before handling the infant.

## 4. Equipment:

### *Incubators and Ventilators:*

- a. Incubators and isolettes should be steam sterilized according to the manufacturer's recommendations following use for each patient.
- b. In the absence of sterilizing facilities, these should be washed & decontaminated with an approved disinfectant between occupancies and at least once in 72 hours when in use for prolonged periods.
- c. The water in the humidifier is to be changed every day.
- d. The air filter in the incubator is to be changed every three months.

## 5. Infant feeding formulae:

- a. Formulae must be prepared and stored with surgical asepsis.
- b. Infant formulae should be tested once a week to see that no more than 25 organisms/ml are present.

## 6. Cleaning:

Refer to the section on housekeeping. The following additional points are to be noted:

- Invasive procedures and feeding should not be done at the time of cleaning.
- A disposable cover gown is to be used while cleaning the nursery.
- **Cradles** are to be cleaned every day with soap and water. Cradles should be cleaned between babies with 7% Lysol.
- **Mattresses** should be exposed to the sun every week for six hours, biweekly if possible.
- Wash **sinks** during each shift.

- Clean **milk fridge** every day.
- Clean **other fridges** weekly and discard old medicines, blood samples, CSF bottles.
- **Humidifier bottles and water and tubings** need to be changed every day, even if not used. The bottle, water and tubing should be changed again if oxygen is discontinued on one patient and a new patient is brought to the same point.
- **Oxygen hoods** are to be cleaned with 7% Lysol every day and between babies.
- The **suction apparatus jar** should be cleaned every day with a change of the disinfectant fluid and the tubings.

#### **7. Linen and Infant's clothing:**

- a. Linen for use in the newborn nursery should be free of laundry chemicals that may cause toxic effects and skin irritation.
- b. New linen should be laundered before initial use.
- c. Soiled linen should be handled with standard precautions to avoid contamination.
- d. Diapers should be freshly laundered.
- e. Soiled diapers should be placed in covered containers lined with a yellow plastic bag and preferably having a step-on lever.

#### **8. Skin, Cord and Eye care:**

- a. Cleaning and bathing of the skin in the delivery room should be delayed until the newborn's temperature is stable, except in case of infants of HIV infected mothers.
- b. After initial observation and stabilization, meconium and blood may be wiped off with sterile cotton sponges with warm water to remove potential blood-borne pathogens.
- c. The skin should then be carefully dried to minimize heat loss.
- d. Newborns can be bathed with plain water or mild soap only as necessary to clean the diaper area.
- e. Except for cleansing and bathing as needed with water alone or a mild soap, the skin and cord may be kept dry for the rest of the hospital stay. This reduces heat loss and skin trauma, and avoids exposure to topical agents with possible adverse effects.
- f. Bacterial colonization of the cord may be limited by local application of acriflavine in spirit. Alternatives include triple dye, Betadine lotion/ointment. Dry care of the cord margins is an acceptable regimen.
- g. Routine use of topical antiseptics such as chlorhexidine for skin and cord care is not required.
- h. Eyes can be cleaned with sterile water.

#### **9. IV Infusions:**

- a. IV fluid infusion bottles, burette sets, syringes and IV tubings should be changed simultaneously to a fresh one at least once every 24 hours.
- b. Sterile needles used as airways from bottles should be removed immediately after pouring out the required quantity of fluid. A fresh sterile needle should be used



each time.

- c. When IV fluids are disconnected for any length of time, cap the tip of the tubing with a sterile needle/cap.
- d. Parenteral fluid bottles, vials, and ampoules should be used only once. Any remaining solution should be discarded immediately.
- e. IV cannulas should be changed every 72 hours.
- f. Splints used to restrain the limb should be clean and dry at all times.

## **II Specialized Nurseries:**

### **1. Neonatal Intensive Care Unit:**

Newborn babies who have severe respiratory distress, birth asphyxia, fulminant sepsis, and are extremely ill need to be admitted to the intensive care facility. Neonatal ICUs are often crowded with equipment and patients. Strict adherence to meticulous hand washing must be observed. Outbreaks are frequently associated with overcrowding, inadequate staff and lack of hand washing with an approved germicidal solution. The recommended staff ratio is one registered nurse for every one or two patients in level III nurseries and 80-ft<sup>2</sup> of floor space per cradle.

### **2. Special care nursery:**

Babies improving after intensive care and other infants requiring close monitoring such as very low birth weight babies, preterms and neonatal surgical patients should also be considered for admission to the special care nursery. The recommended ratio is one nurse for every three or four infants in level II nurseries and one nurse for every 6-babies in level I nurseries. The corresponding floor space is 30-ft<sup>2</sup> per cot in level II facilities and 25 ft<sup>2</sup> in level I nurseries.

Visitors to the intensive and special care nurseries are limited to the parents of the infant.

### **3. Isolation Area:**

An isolation area should be available in the special care nursery after the diagnosis of an infectious disease is made in the mother or neonate. Infectious diseases in the mother or neonate requiring isolation precautions include:-

1. Varicella
2. Congenital rubella
3. Herpes simplex
4. Neonatal gastroenteritis
5. Widespread staphylococcal disease

## **12.7 INFECTION CONTROL IN OPHTHALMOLOGY**

### **Introduction:**

Minor lid and ocular surface infections are common. While they do have significant morbidity in the short term, and long term sequelae are known, they are generally easy to treat. On the other hand, corneal and intraocular infections, endogenous or exogenously introduced during surgical procedures, is nothing short of a disaster. In



other specialities the sequelae of post-operative infection may be only an ugly scar. However infection following intraocular surgery generally results in loss of the globe, adding cosmetic insult to functional injury. Virulent pathogens causing corneal infections can be introduced into the eye by careless examination techniques or contaminated eye drops. Further, Hepatitis-B and AIDS viruses have been identified in lacrimal secretions, suggesting that tears may be a potential route of transmission of these serious systemic illness. A strict protocol of prophylaxis against transmission of infection in clinical ophthalmic practice is, therefore, imperative. At the same time it must be practical enough to involve as little expenditure of time and resources as possible.

#### **A. Infection control in the Outpatient Department:**

##### **1. Hand washing**

This simple step may prevent an epidemic of conjunctivitis or keratoconjunctivitis and should not be omitted. While a sink and soap is ideal for every examination room, it is usually convenient to have bowl of disinfectant solution and towel handy, and to wash and wipe hands between patients. It should be emphasized that to be effective, this precaution must be incorporated as a mandatory step in the clinical routine after examining every patient. A bowl of disinfectant and a towel is provided in every room in our department. Disposable napkins are ideal, but cost constraints and environmental considerations limit their use.

##### **2. Examination Technique: (Lid Eversion etc)**

The examination technique should be designed to permit as little contact between secretions and examiner as possible. Specifically, the routine eversion of the lids practised by all ophthalmologists should ideally be performed using Q-tips ("kutchi", cotton buds). In this situation too, hand washing is important.

##### **3. Tonometer and Instrument sterilization**

All ophthalmic patients have their intraocular pressure (IOP) measured at some time or the other. The tonometer or tonometer tips are potential sources of transmission of infection between patients. Applanation prisms are disinfected by immersing them for 5-10 minutes in 5 parts per million of sodium hypochlorite (Dakins) solution. It is convenient to have at least two prisms for each tonometer to facilitate patient flow. Schiotz tonometers are disinfected by immersing the footplate in the same solution for 5 minutes. In order to prevent chemical injury to the cornea, these instruments are rinsed in sterile saline before use. Fluorescein is used in the form of single dose applicators to reduce the risk of contamination often found in fluorescein drops.

Eyelid retractors, epilation and other forceps etc., are resterilized by boiling, autoclaving or any preferred technique after each use. In high volume practices, or where there is a shortage of instruments, immersion for 3-5 minutes in acetone is an acceptable alternative.

##### **4. Eye drop Instillation**

Most ophthalmology units have areas where patients have their pupils dilated. This is a potential area for the transmission of infection through contamination of dropper tips. It is impractical to have a bottle of dilating drops for each patient, and the technique of eye drop instillation is important in preventing the spread of infection. The bottle is held between the fingers of the right hand, and the protective cover removed. The patient is



asked to look up, and the lower eyelid pulled away from the globe to expose the lower fornix as a "pouch". The eye drop is instilled into this pouch, taking care to avoid any contact between the dropper tip and the patient's tissue (lid conjunctiva) or secretions. The cap is replaced on the bottle to avoid any air borne contaminants. The eye drop bottles should be freshly opened for each day's use.

## **B. Infection Control In the Ward:**

### **1. Examination Technique**

The principle of hand washing between patients must be adhered in the ward also. This is especially important when dealing with post-operative patients. The examination "unit" in the ward is the dressing trolley, which incorporates a bowl of disinfectant and a towel. Sterile swab sticks are used to clean the lids and avoid contamination of the hands. It is usual for the nursing staff to open the bandage and perform the external cleaning of the eye. The rounds in the septic wards are done by another team of doctors, using a separate trolley and flashlight. Alternatively, this ward is dealt with at the end of the rounds. The ward slit-lamp is used for "dirty" cases only at the end of the rounds, and is cleaned with a disinfectant solution immediately after.

### **2. "Dedicated" Eye Drops**

The patient in the ward has his own set of eye drops kept by his bedside. This concept prevents any spread of infection that may arise through sharing of eye drops (much like sharing of needles). Routine precautions for prevention of contamination of dropper tips must be maintained. Patients' relatives are trained to instill eye drops for their wards, as this may prevent cross contamination through the medical personnel involved. Each bottle must be freshly opened and used for no longer than 7 days. Fresh supplies must be prescribed for use after surgery. Single application packs for eye drops and ointments are preferred when the risk of infection is high in the OR. However, this may not be practical in certain settings.

### **3. Isolation of Wards**

The septic ward is physically removed from the "clean" wards housing routine pre-and post-operative patients, and their trolleys and instruments are separately maintained. While it may be impractical to use separate staffing for these wards, the doctors at least are posted exclusively to these wards. As mentioned, the ward rounds here are done last of all.

## **C. Infection Control in the Operating Room:**

### **1. Cleaning Procedure (microscope)**

The microscope is an important instrument for any Ophthalmologist but its cleaning is often neglected. Many surgeons sterilize the microscope using formalin powder. The entire microscope is covered in a plastic cover, with formalin powder enclosed. The formalin, however, is not good for the electronic components of microscopes, and can also damage the optics. The microscope is left in the OR when fumigation is undertaken, but routinely wiped with Bacillocid solution. The optics are cleaned with antistatic cloth. Sterile handles are used to manipulate the microscope and adjust the interpupillary distance. Draping the microscope reduces the chances of accidental touch while passing instruments / pulling sutures.



## **2. Clean Air**

With modern day cataract surgery, the eye is kept open for much longer than in the past. This together with the implantation of an intraocular lens makes it imperative to have as clean an atmosphere as possible in the O.R. An air module on the wall blows in air filtered through 0.3 micron filters. The air conditioning is provided by appropriate split units which cool and recirculate filtered air. The O.R is under positive pressure, and this prevents contamination from occurring when doors are opened to transfer patients etc.

## **3. Pre-operative and intra-operative care**

Intraocular implants (intra ocular lenses, glaucoma sections etc.) are also handled only with instruments. The intraocular lens is inserted with minimal contact with ocular surfaces (lids and conjunctiva or surgical drapes. Some surgeons use a plastic glide to avoid contact with conjunctiva and thereby prevent potential contamination with commensals (eg. *Propionibacterium spp.*) that have been shown to cause infections. Contact between instruments, intraocular lenses, sutures etc. and eye brows/eye lashes is minimised by appropriate draping using steridrapes and trimming eyebrows and eye lashes. Pre-operative antibiotic instillation as well as instillation of povidone iodine also helps in sterilising the conjunctival sac.

## **4. Instrument Sterilization**

In addition to the standard techniques used, ethylene oxide sterilization is frequently used in ophthalmology. It is advisable to use chemical sterilization with care since residual chemicals in irrigating canulas and instruments can lead to corneal decompensation.

## **5. No-touch Technique**

It is felt that this is the single most important method to prevent surgically acquired infections in ophthalmology. No part of any instrument (tips) or suture that will enter the ocular tissues or spaces is touched by hand, gloved or otherwise. This means that sutures are always handled and tied using only instruments.

## **6. Tissue transplantation**

Corneal transplantation is a major, yet common surgical procedure in ophthalmology. The possibility of transmitting infections through the donor cornea is real. Cases of rabies transmitted through the donor corneas have been reported, and the use of such material is absolutely contraindicated. Hepatitis B as well as HIV has the potential for transmission through corneal grafting. Although none of the inadvertent recipients of corneas from AIDS patients have seroconverted, HIV positivity in a donor is considered an absolute contraindication for use of corneas for transplantation. In India it is not mandatory to screen potential donors for HIV. Considering the relative paucity of donor material and the emotional issues involved, it is unlikely that HIV testing of corneal donors will be made mandatory in our country anywhere in the near future.

## **7. Microbiological monitoring**

This is conducted once a month. Settle plates are kept in the theatres, swabs are taken from common dust settling areas and anaesthetic apparatus. Fluids that are used in ophthalmology, such as atropine and other eye drops are also subjected to microbiological analysis. In addition to cultures for bacteria, cultures for fungi are also



performed.

*Prevention of hospital acquired infections is important in all fields of medicine, but in ophthalmology, even a "minor" intraocular infection could be disastrous.*

## 12.8 ENT DEPARTMENT

### **Routine precautions for all patients:**

1. Wear a mask while examining all patients
2. Use gloves when intra-oral examination is required
3. Instruments are disposed into a basin containing 7% lysol, after which they are boiled in a sterilizer for 10 minutes. They are then sterilized by autoclaving at 15 pounds pressure for 15 minutes.

### **Additional precautions for patients known to harbour blood borne pathogens:**

1. Wear double gloves and a plastic apron for all procedures.
2. After use, instruments are segregated in a red bag and sent for double-autoclaving.

## 12.9 RADIOLOGY

The various interventional procedures carried out in the department of Radiodiagnosis are:

- a. Vascular
- b. Ultrasound guided biopsies and drainage procedures
- c. CT guided biopsies.

*For all these procedures:*

1. Use sterile equipment and aseptic technique
2. Observe universal precautions strictly. All staff should be immunised against hepatitis B. No one with any open sores, cuts or nicks takes part in the procedure.
3. Meticulous housekeeping is very important (Refer to the chapter 'Housekeeping').

### **a. Vascular:**

The persons doing the study and the assisting nurse scrub up and wear sterile gowns, cap, mask and gloves. The part of the body where intervention is to be carried out is painted with Povidone-iodine and draped with sterile towels. Any part of the x-ray machine, which may come in proximity of either the patient or the examiner, is also draped with sterile towels.

### **b Ultrasound guided/CT guided biopsies:**

The person doing the procedure washes up and dons sterile gloves. The part to be biopsied is painted with Povidone-iodine and draped with sterile towels.

### **c. Drainage procedures:**

If any infective material like pus is drained or collected into the tray or bowl, the procedure is treated as infected. The reusable materials are separated. After the procedure, the room is mopped with 7% Lysol solution and the parts of the machine that may have come in contact with the patient are cleaned with a disinfectant.

**d. IVU:**

A disposable scalp vein set is used for the venupuncture and contrast is given

**e. MCU:**

The perineum is prepared prior to the procedure. The perineum is painted with Povidone-iodine and Benzalkonium HCL solution and draped with a sterile surgical towel. Sterile equipment is used for the catheterisation procedure.

**After all procedures, discard the waste generated as per hospital guidelines given in the chapter on Hospital waste management.**

**\* Sterilisation:**

The catheters, guide wires, vessel dilators and needles used in vascular procedures, Chiba needles, FNAC needles are flushed with tap water. They are then dried and packed in butter-paper covers. They are sent to CSSD for gas sterilization.

All metal instruments used eg. clamps, trays, bowls and glass syringes are washed, cleaned, packed and sent for autoclaving twice a day. The same is done for catheters used for giving enemas.

The 50ml. plastic syringes used are dipped into liquid soap solution in hot water. They are then brushed, washed, dried and kept in polythene bags with a gauze piece and sent for gas sterilization.

**\* Infectious/Isolation ward patient :**

If any patient is identified as infectious before hand, cases are adjusted such that the waiting time and transit time of this patient is minimal and spread of infection is minimal. The procedure is done preferably at the end of a session.

As far as possible only disposable equipment is used. All re-usable is collected in a red bag and sent to CSSD. Linen is decontaminated by soaking in 7% lysol for 1 hour and then sent to the laundry.

The room is then mopped with Lysol 7% solution and machine parts are cleaned with Dakins.

## **12.10 PHYSICAL MEDICINE & REHABILITATION (PMR)**

In the Department of P.M.R the following techniques are used to prevent infections from occurring and spreading. It is advised that every member of staff assumes that every patient is potentially a carrier of blood borne pathogens and that every care is taken to protect herself/himself and to prevent cross infections using universal precautions.

**Out patients :**

Wash hands after examination of each patient

Practice no-touch technique for dressings and simple OP procedures such as local instillation of drugs with disposable syringe and needle, suture removal with autoclaved packs.

Autoclave/gas sterilization of Electro myograph accessories.



**In patients :**

Daily dressing of wounds **without** using topical antibiotics/ antiseptics so as to prevent colonisation with drug resistant bacteria.

No touch technique is to be followed for daily dressings

Use gloves for dressings and when debriding wounds etc.

Use antibiotics appropriately when the need arises.

Identify & isolate patients with infectious diseases.(refer to the chapter 'Isolation policies and procedures')

Change bedding twice weekly or more often if grossly contaminated.

Specific cleaning methods are advised for PMR type of mattresses (ripple mattress, water mattress, split mattress etc.)

Use sterile LP packs/catheter packs/blood culture set when procedures are done.

**Catheter :** The following methods are recommended for patients requiring continuous bladder drainage. (Refer to the chapter 'Care of systems and indwelling devices')

- a. Weekly change of urinary catheter by using strict aseptic technique, special catheter packs, non-traumatic techniques and as far as possible ensuring not to break the seal between the bag and the catheter.
- b. Every care should be taken not to lift the bag above the level of the catheter at any time.
- c. In the later part of the rehabilitation programme the patient is weaned off the catheter and intermittent catheterization (ICC) technique is taught to the patient or to the patient's relative if he/she is unable to do it.

**Housekeeping & Waste disposal:** - Refer to the respective chapters.

**12.11 RADIOISOTOPE LABORATORY**

1. "Good housekeeping" should be maintained at all times. The laboratory should be kept neat; glassware washed regularly
2. Waste and contaminated materials should be discarded as per hospital guidelines
3. No food is allowed in the radioisotope unit.
4. Protective outer garments, such as laboratory coats and rubber gloves, should be worn by personnel while handling radioactivity.
5. All radioactive set up should be stored in appropriate shielded containers in secured areas.
6. Set up should be made on easily cleanable trays.
7. All trays and all other work surfaces should be covered with disposable absorbent paper.
8. Pipetting by mouth is not allowed. An automatic pipette should be used for pipetting radioactive material.
9. Areas used for elution of generators, preparation of radio-pharmaceutical and preparation of patient doses should be surveyed for contamination after each procedure and/or the end of each working day.

10. The patient treatment area should be surveyed each day to make sure they keep up to the standards.
11. Follow universal precautions while performing any invasive procedure. Use gloves for drawing blood samples and injection of radio-pharmaceuticals in ALL patients
12. Use disposable syringes and needles.

## 12.12 CARDIAC CATHETERISATION LABORATORY

### Follow universal precautions for all patient care

#### I. Patient preparation:

Before leaving the ward, the insertion site is shaved and washed with soap. The patient is then sent to the lab in clean ward clothes. In the lab, the insertion site is cleaned as follows:

- Brachial approach -spirit -iodine -spirit.
- Femoral approach -cleaned thrice with betadine solution.
- The catheter sites are draped with sterile towels & a sheet.

#### II. Lab Personnel:

- ✱ Entry to the lab is restricted to the minimum essential.
- ✱ Street shoes are not allowed in the lab area. Washable slippers covering the dorsum and sole are to be worn by all personnel within the lab.
- ✱ Operators wear freshly laundered lab shirt, pyjamas, mask and cap. Scrub hands for 10 minutes using a sterile brush, soap and water before each case. Then wash hands with spirit and wear sterile gown and gloves.
- ✱ Anyone entering the lab should change into clean shirt & pyjamas, and wear a mask and a cap, which are provided in the cath lab.

#### III. Lab Disinfection

- ✱ The floor of the lab is cleaned daily (at the end of all the cath procedures) using detergent and water. Mop in the morning
- ✱ Blood spills should be immediately covered with 1% sodium hypochlorite for 10 minutes and then cleaned.
- ✱ Instrument trolley, IV stand, pressure injector stand etc., are washed twice weekly with detergent and then disinfected.
- ✱ Pacemaker implantation: Prior to pacemaker implantation the cath lab is cleaned with formalin so that the fumes circulate in the lab for 24 hours prior to the procedure.

#### IV. Instruments:

Instrument tray, guide wires, suture needles, arteriotomy set, glass syringes and angio syringes are autoclaved.

Metal instruments such as metal connectors and connecting tubes, which do not come into patient contact, may be reused after thorough cleaning and boiling for 20 minutes. Plastic items like transducer and dome, teflon syringe used with angio syringe and pick up clamps are subjected to high level disinfection by immersing in 2% glutaraldehyde solution for at least 20 minutes. These instruments are to be washed thoroughly with



water before and after immersion in glutaraldehyde. Adhere to manufacturers instructions for use of glutaraldehyde.

Cardiac catheters, pacemakers, endotracheal tubes, pressure extension tubes and angioplasty material are subjected to ETO sterilization.

*Cleaning of cardiac catheters:*

- ✱ Initially catheters are flushed with water 3 to 4 times.
- ✱ H<sub>2</sub>O<sub>2</sub> is then flushed through the catheters.
- ✱ The whole catheter is then immersed fully in glutaraldehyde solution for 45 minutes.
- ✱ The catheters are then again flushed with water and completely dried.
- ✱ They then undergo ETO sterilization. After ETO sterilization the catheters are placed on a clean shelf for at least 3 days for residual ETO in the packing to be reduced to acceptable levels. The catheters are then stored in an area free from dust and moisture.

*Balloon catheters*

All angioplasty balloon catheters should be ETO sterilised before reuse.

Valvuloplasty balloon catheters (with the exception of Inove type A balloon catheters) are sterilised by filling the balloon and the guidewire lumens with 2% glutaraldehyde and then immersing the entire catheter in glutaraldehyde for 30 minutes. After that, the exterior, balloon lumen and wire lumen are thoroughly rinsed with distilled water and dried.

**V. Waste disposal:** As per hospital guidelines (refer to the chapter on hospital waste disposal)

**VI. Microbiological monitoring:**

Cultures are done once a month from floor and equipment, and depending on the report further action like fumigation etc., are undertaken.

### 12.13 THE BONE MARROW TRANSPLANTATION UNIT

Optimal care of the immunocompromised patient is a major factor in the success of any bone marrow transplant program. Minimizing the chance of life threatening infections, requires stringent infection control techniques and policies involving the co-ordination of both medical and nursing personnel.

Patients are nursed in the BMT unit. This is a three bedded unit which receives HEPA filtered air under positive pressure. Before a patient is admitted into the unit the individual room is cleaned and the cleanliness of the air monitored by a surveillance culture as follows:

**Monitoring the HEPA Filter system:**

A particle check is done periodically or earlier as indicated using a particle counter to monitor the quality of air that enters the room as well as the airflow. The problems that may need to be rectified include breaches in the seal between the HEPA filter and the room, faulty blowers and the integrity of the HEPA filter itself.



### **Fumigating the Unit**

This is done only when required by the policy for fumigation. The room is first wiped down with soap and water. Following this, a 2% solution of Bacillocid TM is sprayed on the walls and ceiling and left as such for 24 hours. The glutaraldehyde liberated fumigates the room distal to the HEPA filter.

### **Microbiology Surveillance Cultures**

Once the room has been fumigated the air is monitored for bacteria and fungi by means of settle plate cultures. If there is reason to infer that the quality of air is unacceptable, the room may be cleaned again and/or the HEPA filter system monitored as above. If indicated, the entire HEPA filter system and the room may need to be fumigated with formaldehyde gas proximal to the filter.

### **Nursing Protocols**

Rules on entry of personnel to the unit, food, sterile supplies, basic care of the neutropaenic patient and Hickman catheter dressings are amongst the many procedures clearly written out in the nursing protocol manual which is kept in the unit and periodically updated. The salient features are outlined below:

#### **Entry to the Unit**

Entry to the unit is limited to the transplant personnel, one patient relative and maintenance personnel if needed. After changing into autoclaved pyjamas, overshoes and a cap, the hands are washed up to the elbows with soap and water. This qualifies entry only into the nursing station. To enter an individual patient room a second hand wash is done using an antiseptic scrub and a sterile surgical gown is worn. Masks are worn only if a procedure is to be done.

#### **Patient Relatives**

In order to minimize traffic in and out of the unit, only one relative is allowed to be with the patient for limited period in the evening. For paediatric patients the rules are more relaxed particularly if the child can not be without the parent. Under such circumstances the parent may be allowed to stay with the patient as long as needed.

#### **Food**

Sterile (autoclaved) water will be provided by the pharmacy for drinking. Food will be sterilized by pressure cooking. The pressure cooker is opened inside the nursing station and delivered to the individual patient rooms. Salads and fresh fruits are not allowed.

#### **Cleaning of the Unit**

The unit has to be kept meticulously clean. The floors are vacuumed twice a day and washed with hot boiled water and detergent. The toilets are cleaned twice a day with lysol. The beds, lockers, tables and window ledges in the individual rooms are damp dusted twice a day with soap water.

#### **Autoclaved Supplies**

All articles which are sent to the central sterile service department for autoclaving are sent in a double wrap. Once autoclaved, the outer wrap is removed at the receiving door and the inner wrap removed inside the transplant unit.



### **Mouth and skin care of the patient**

Proper care of the mouth, skin and mucous membranes is vital in the basic management of the immunocompromised patient. In providing this care, the nurse also has the opportunity to examine the skin and mouth and to report suspicious findings to the transplant physician.

#### **Routine Mouth Care**

The aim is to keep the teeth clean and buccal mucosa clean and moist. A mouthwash with 0.5% chlorhexidine is done four times a day. In addition the teeth are brushed after all meals using a soft brush. Warm diluted sodium bicarbonate has a good cleaning effect and is suitable for dissolving mucin and loosening debris even if oral ulcers are present. A thin layer of sterile liquid paraffin is smeared over the lips if they are dry.

#### **Skin care**

All patients are required to bathe or given a sponge bath atleast once a day. Particular emphasis is placed in the cleanliness of the groin, perianal regions and armpits. The skin is completely dried thereafter. The patients then receive a clean set of autoclaved clothes and bed linen.

#### **Bowels**

Due to the risk of anal fissures and perianal infections in these patients, the perianal region is washed thoroughly and betadine ointment applied locally after each defaecation. Daily bowel movements are monitored in order to prevent or treat constipation.

#### **Handling of Venous Access Sites**

All procedures involving administration of intravenous medications and blood products are done with standard sterile precautions as per the nursing protocol. The transplant physician or an experienced nurse is responsible for the routine Hickman catheter dressings. Any evidence of a tunnel infection is attended to immediately.

#### **Prophylactic Antibiotics**

Prophylactic antibiotics are not used. A stool surveillance culture is sent once a week to document the flora of the GI tract and the sensitivity pattern of the organisms. Appropriate combination of antibiotics is started after blood culture is taken at the onset of the first spike of fever.

## **12.14 DIALYSIS UNIT**

Infection control may be divided into three major areas

- 1) Prevention of transmission of blood borne pathogens (HIV, Hepatitis B and C) from patient to patient, and patient to staff or vice versa. The technique of haemodialysis per se is believed to provide a mode of transmission of these pathogens.

- 2) Prevention of spread of microbial infection between patients, especially those with vascular accesses. Specific emphasis is on spread of MRSA.
- 3) Maintenance of water quality within microbiological standards laid down by the AAMI

### **A. Blood borne pathogens**

#### ***Control Measures***

- 1) It is mandatory for all employees working with dialysis patients to have a complete course of immunization with hepatitis B vaccine, with demonstration of protective levels of antibody.
- 2) All categories of health care workers must be educated on the precautions to prevent transmission of hepatitis B, C and HIV. Strict supervision of all work areas is essential.
- 3) Unless the situation is a dire emergency, it is mandatory to test all patients for HBsAg, HCV antibody and HIV antibody before haemodialysis.
- 4) Patients positive for hepatitis B, C or HIV are to be dialysed in an area separate from those who are negative. A scheme of segregation of patients and machines, also applicable to dialyser re-use, presently in force in this unit is given on page 119.

Complete serology (HBsAg, Anti HBc, HIV ab, Anti HCV) results are obtained over the next 2 weeks, and the situation is reviewed. A patient may be shifted from the positive side to the negative side if the serological markers for HBsAg and HCV revert and test negative consistently. If available, respective PCRs also should be negative and liver enzymes normal.

#### **Hepatitis B & C:**

- 1) All patients negative for HBsAg are given vaccination. (Intradermal schedule - 0.25ml in 4 interscapular sites twice weekly for 6 weeks OR Intramuscular schedule - 1ml into each deltoid monthly for 3 months). Refer to page 118.
- 2) Monitor Hepatitis B and C status monthly, to guide placement and immunization.
- 3) Disposable gloves, masks and gowns or aprons should be used when caring for patients. Gloves should be worn when taking BP, injecting saline or heparin and for touching dialysis machine knobs. Use a fresh pair of gloves for each patient.
- 4) Gloves must be used while taking blood or handling potentially infectious body fluids.
- 5) Blood and other specimens from patients infected with a blood borne pathogen should be labeled as "Biohazard" when sent the various laboratories for testing.
- 6) Wash hand immediately after each contact with all patients or their blood and other body fluids. Hands should again be washed after removing gown and gloves and before leaving the room.
- 7) Transducer protectors should be used to prevent blood contamination of venous and arterial pressure monitors. They should not be reused if found contaminated with blood.



- 8) Utmost care must be taken to avoid accidental needle pricks with sharp instruments which may be contaminated by the patients blood. Also avoid contact with open skin lesions in these patients.
- 9) If there is accidental blood spillage the staff present should pour 1% sodium hypochlorite over the spill. Wait for 10 minutes and then clean the area.
- 10) The dialysis machine should be cleaned carefully and thoroughly after the dialysis treatment is over with 1% bleach solution.
- 11) Use only disposable hypodermic and fistula needles. These should be discarded into the sharps container immediately after use.
- 12) Constant vigil should be maintained by the staff to minimize the risk of infections.
- 13) Non disposable items in the hepatitis serology positive area should be sent to CSSD in the 'red bag'. Gloves should not be recycled in this area and are to be discarded into yellow plastic bags.
- 14) No food or drink should be consumed inside the dialysis room by the staff.
- 15) Reuse areas for dialysers and tubings are divided into separate areas based on the serologic status of the patient. While cleaning these items, staff are advised to wear aprons and masks as protection from splashing of infective material.

#### HIV positive patients

HIV positive patients are not offered maintenance haemodialysis (HD). If, however, a known HIV positive patient were to develop acute renal failure or require HD in preparation for a surgical or other procedure the unit policy is to offer them dialysis support. CAPD may be the more appropriate mode of maintenance dialysis for HIV sero positive individual. Should an HIV positive patient require dialysis support, the following measures are adopted.

- Label all documents (case sheet, dialysis folder progress sheets etc) with a biohazard sticker.
- Isolate these patients and do not reuse the designated machine without thorough disinfection.
- Therapist and nurse are designated. There should not be rotation of staff to other categories of patients during the HD session. Wear gloves, aprons, overshoes and masks.
- Follow items 3-15 from the section on Hepatitis B & C.

#### **B. Prevention of spread of microbial infection between patients especially with vascular accesses.**

Specific emphasis on spread of MRSA needs to be remembered here, since this forms an important cause of hospital acquired vascular access infection in dialysis patients.

1. Masks, aprons and gloves are indicated during handling of vascular accesses
2. Handwashing and the use of disinfectant handrub is mandatory before opening any access and between patients. Use of handrub is not a substitute for handwashing, but a supplementary measure.



- 3. Sterile technique is to be used during procedures involving handling of vascular accesses.
- 4. Access site is to be cleaned thoroughly with disinfectant before starting dialysis.
- 5. Sterile dressing is to be used over the access site.
- 6. Use separate sets for each patient.
- 7. If MRSA has been isolated from the patient, contact isolation procedures are to be practised. Surfaces and cot are to be cleaned with 7% lysol ; linen to be soaked in 7% lysol for at least one hour before being sent to the laundry. Masks, gloves and aprons to be discarded into yellow plastic bags and not recycled. Staff assigned to this patient should not rotate to other patients during the HD session. Non disposable items should be sent to CSSD in the 'red bag'.

C. Maintenance of water quality

During dialysis each patient is exposed indirectly to 1500 litres of water per month. Therefore the clinical and microbiological quality of water used for haemodialysis should be within acceptable standards. The use of water filters, softeners and reverse osmosis (RO) are necessary to ensure chemical purity, if the distribution delivery system is made of inert material (eg. stainless steel, or synthetic material).

Reverse osmosis is also effective in minimising both bacterial counts and endotoxin concentration in the water. However, stagnation in the delivery system, presence of loops and bends, use of bicarbonate concentrate - a good nutrient medium - and warming of the dialysate to 37° C are all factors that potentiate microbial contamination of water.

The AAMI microbiological and endotoxin standards for HD fluids are as follows:

<u>Type of fluid</u>	<u>Bacteria</u>	<u>Endotoxin</u>
Water used for dialysate	<200 CFU/ml	No standard
Dialysate (Machine outlet)	<2000 CFU/ml	No standard
Bicarbonate concentrate	<200 CFU/ml	<1ng/ml.

The following are the recommended methods to achieve the above:

- 1) Use of online UV light (253.7nm) disinfection inactivates bacteria and viruses, due to the specific damage caused to microbial nucleic acids.
- 2) Use of an ultrafilter at the water inlet of the dialysis machine. These are hollow fibre synthetic membrane filters.
- 3) Periodic cleaning and disinfection of the dialysis machines including all parts of the hydraulic system.
- 4) Proper design of the distribution and delivery system, with avoidance of blind ends or loops and preferably a circulation system.
- 5) Periodic disinfection of the delivery system. The procedure of disinfection of the water used for dialysis is as follows:
  - ✱ A sample of RO water is tested for chloride levels.
  - ✱ Disconnect all machines and move them out. Close all outlet valves.
  - ✱ Close all output valves from the tank.

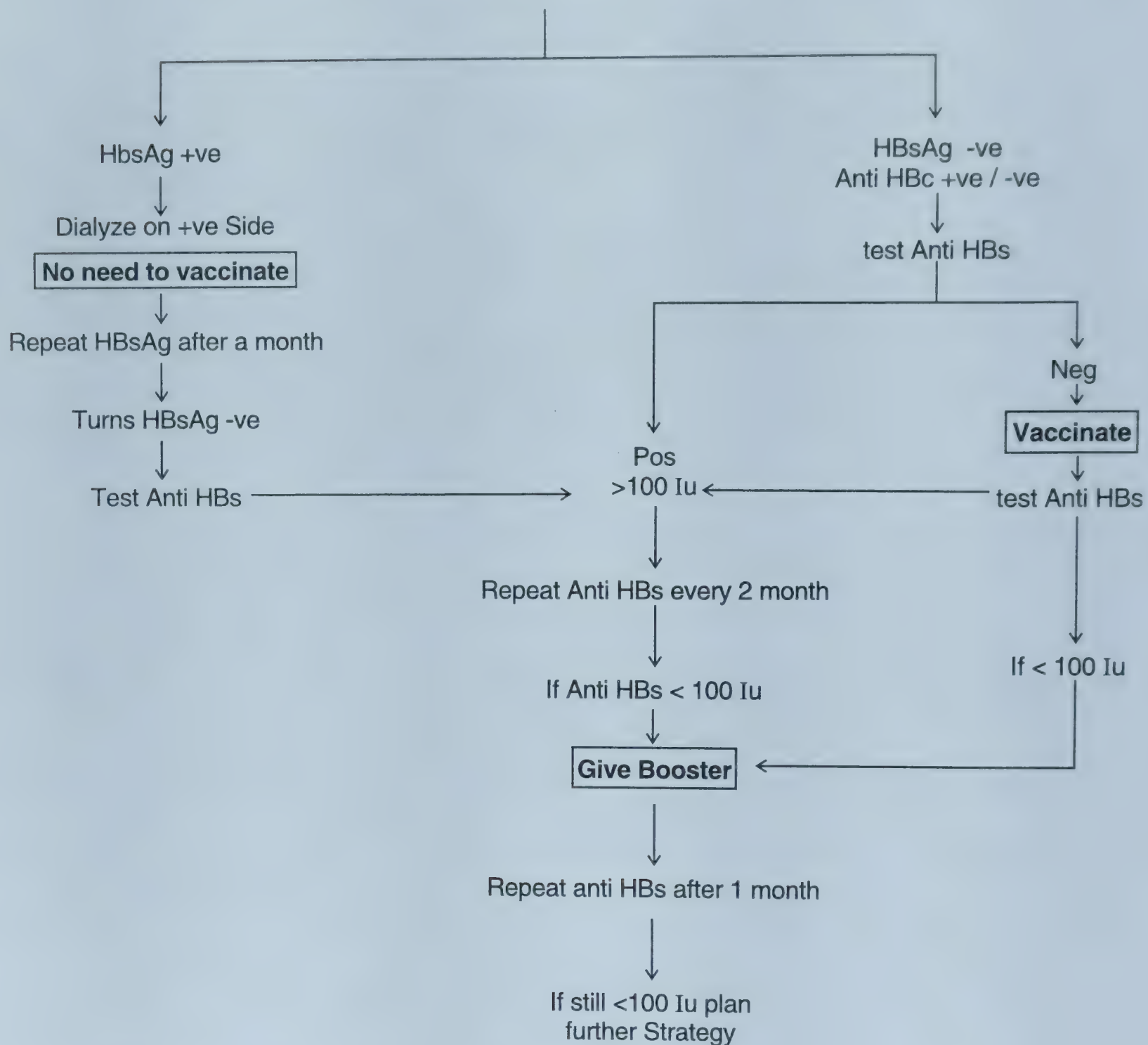


- ✱ Clean the RO tank thoroughly and fill the tank with 2% sodium hypochlorite.
- ✱ After ½ hour, open all valves and allow the hypochlorite to drain.
- ✱ When 10-20 litres are remaining in the tank, close all the outlet valves and allow the hypochlorite to dwell in the tubes for ½ hour,
- ✱ Open all valves and continuously flush with RO water.
- ✱ Samples of water are collected at terminal outlets of each unit every hour and the chloride levels are tested. This is continued until it is equal to the pre-disinfection levels.
- ✱ Record all values of chloride.

6) Periodic surveillance cultures of water sampled at specific points of the system is performed.

## VACCINATION PROTOCOL

Day 1 : Send HBsAg Anti HCV Anti HBc



Current Vaccination Schedule : Inj. Engerix lcc ID 2/wk for 6 wks.



# MONITORING OF HEPATITIS SEROLOGY AND PATIENT PLACEMENT IN THE DIALYSIS UNIT

MONITORING	NEGATIVE SIDE	POSITIVE SIDE
1. At admission	-ve ←	HBsAg, HIV Ab → +ve
2. 1st week on HD	-ve ←	Anti HBc, Anti HCV → +ve
3. Raised liver enzymes at any time	-ve ←	Repeat HBsAg, anti HBc & anti HCV Consider HBV - DNA PCR / IgM anti HBc HCV - RNA PCR → +ve
4. Monthly	Anti HBc HBsAg Anti HCV	<div> <div>I</div> <div>II</div> <div>III</div> <div>IV</div> </div> <div> <div>Anti HBc +ve</div> <div>HBsAg -ve</div> <div>Anti HCV -ve</div> </div> <div> <div>HBsAg +ve</div> <div>Anti HBc +ve</div> <div>Anti HCV -ve</div> </div> <div> <div>HBsAg -ve</div> <div>Anti HBc -ve</div> <div>Anti HCV +ve</div> </div> <div> <div>Anti HBc Pos</div> <div>HBsAg +/-</div> <div>Anti HCV pos</div> </div>

Basis for Groups - for

- Machine Segregation
- Reuse Segregation

Groups I & III should continue to receive I/D Enderix as per schedule. If group IV is HBsAg Negative but anti HBc positive, continue I/D Enderix as per schedule.







